19 MARCH 1980 (FOUO 3/80) 1 OF 1

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USSR Report

AGRICULTURE

(FOUO 3/80)

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USSR REPORT

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CONTENTS PAGE

LIVESTOCK FEED PROCUREMENT

INTEGRATION OF THE MEAT INDUSTRY WITH AGRICULTURE

Moscow VOPROSY EKONOMIKI in Russian No 6, Jun 79 pp 83-91

[Article by Solomon Solomonovich Shnitser, doctor of economic sciences, professor, and consultant to the All-Union Scientific Research Institute of the Meat Industry, Nikolay Dmitriyevich Kondratyuk, candidate of economic sciences, head of the division of scientific organization of labor at the Central Scientific Research Institute of Information and Technical-Economic Research of the USSR Ministry of Meat and Dairy Industry, and Sergey Yevdokimovich Krasnov, doctor of economic sciences, professor, head of the department of industrial economics of the Moscow Technological Instute of Meat and Dairy Industry: "Integration of the Meat Industry with Agriculture"]

[Text] The July 1978 Plenum of the CPSU Central Committee stressed the prime importance of a further rise in meat production as a crucial condition for raising the public standard of living. The problem of providing meat and meat products to the people is multifaceted, involving participation by all the chief economic sectors included in the agroindustrial complex (agriculture, industry, transportation, trade and public catering, and others). Closely following the agrarian policy worked out by the Communist Party has produced definite results. The average annual production of meat has risen from 9.2 million tons in 1959-1965 to 14 million tons in 1971-1975, while meat consumption per capita has increased from 41 kilograms in 1965 to 57 kilograms in 1977.

Nonetheless, the public demand for meat is still not being completely met. The decree of the July 1978 Plenum of the CPSU Central Committee defined steps to further the development of agriculture and, in particular, to intensify animal husbandry, switch it to an industrial basis, and build up the material-technical and feed base. This decree pointed to the need to bring meat production to 19.5 million tons by the end of the 11th Five-Year Plan. This will make it possible to increase per capita consumption and approach scientifically established norms.

Establishing stable production ties in all the stages through which the product passes from agriculture to the consumer is a crucial condition for the rise in agriculture. In addition to meeting the primary challenges of significantly increasing the production and sale of agricultural output, improving its quality, raising labor productivity, and reducing expenditures per unit of output, specialization and concentration of agricultural production based on interfarm cooperation and agroindustrial integration are expected to insure rational use of this output during industrial processing and preservation of its quality throughout its passage to the consumer.

The meat industry is a key element of the agroindustrial complex. It includes more than 900 enterprises and has fixed capital worth 3.1 billion rubles. Most of its enterprises have up-to-date equipment -- conveyor lines for slaughtering the livestock, mechanized flow lines for processing slaughtered animals and producing sausage goods, canned meat, semifinished articles, and other forms of output. Almost all enterprises have refrigerator facilities and shops to produce dry livestock feed. In 1977 industrial production of meat reached 9.1 million tons, 75 percent above the 1965 level. Production of sausage goods stands at 3.0 million tons, a rise of 87.6 percent. The greatest increase was achieved in the production of semifinished meat products; during this time span it tripled. The proportion of meat products that are in ready-to-use condition is steadily growing, a factor of great social importance. It makes the preparation of food by women easier and gives them more free time. In addition to large pieces of meat enterprises of the meat industry are producing ground meat, boneless meat, blocked meat, specially molded shapes of meat, sausages and smoked meat, canned meat, pel'meni, meat balls, and other articles. At the same time they insure optimal efficiency in use of subproducts, blood, edible and industrial fats, raw material for leather, endocrine-enzymal raw material, and by-products.

Applying scientific-technical advances and refining the organization of production, labor, and management have permitted a substantial rise in labor productivity. Output per employee in the meat industry in 1970 was 122 percent of the 1965 figure, and by 1975 it was 151 percent. But the rate of growth of production capacities in processing dustry is not keeping pace with the development rate of animal husbandry. Thus, while sale of meat products to the public through the state and cooperative systems almost doubled between 1965 and 1977, the capacities of the enterprises rose just 20 percent for meat production, 45 percent for production of sausage, seven percent for canned meat, and 31 percent for refrigeration space.

As the production base grows the proportion of meat that is processed by industry increases. In 1977 67 percent of the meat output went through industrial processing, where in 1965 the figure had been just 59 percent. But this level of industrial processing of raw material is inadequate; in the developed capitalist countries it is more than 90 percent of all slaughtered livestock. As a result of the shortage of capacities, about 10 million tons of livestock, or one-third of gross production, is processed each year at technically backward enterprises or away from industrial enterprises altogether. This leads to great national economic losses. Calculations made at the All-Union Scientific Research Institute indicate that the loss of meat, blood, endocrine-enzymal raw material, and other products from the slaughter process because of imperfect processing methods is about 300 million rubles a year. This loss can be eliminated by concentrating the processing of slaughtered livestock at specialized meat industry enterprises which have up-to-date equipment and use advanced technology.

At the present time meat industry enterprises are supplying meat products primarily to the urban population. A number of problems related to increasing production capacities and the storage, transporting, and sale of output must be solved to establish broad-scale sale of these products to the rural population, chiefly based on processing of raw material belonging to kolkhozes and private farms at industrial enterprises. The production capacity of the meat industry must grow through both construction of new enterprises and modernization and expansion of existing ones.

The existing discrepancy between livestock slaughtering and processing shops and refrigeration facilities, as well as shops for post-slaughter product processing, is a major brake on development of the production of meat products. Elimination of the "bottlenecks" will make its possible to use present capacities more fully. The production of meat products must be increased concurrently with a rise in production efficiency by fuller loading of fixed capital and rational use of raw material and other physical resources, as well as a rise in labor productivity. Concentration of production is one source for raising the economic efficiency of work by the meat industry.

Slaughter livestock are a complex package of raw materials from which many different food, industrial, and special-purpose products can be obtained by processing. Production of a broad assortment of products and comprehensive use of the raw material are feasible only at large enterprises with up-to-date equipment. Large enterprises with good equipment produce 1,700-1,800 rubles (wholesale prices) worth of output per ton of livestock processed, compared to 1,100-1,200 rubles worth at small enterprises. Only large enterprises can assure the necessary sanitary conditions, which requires appropriate sanitary engineering structures, for example to decontaminate waste water.

Meat combines built in the prewar decades had capacities of 50-100 tons of meat per shift and more, for the most part. In this period meat combines were built in Moscow, Leningrad, Semipalatinsk, and many other cities. These enterprises, founded on the principles of combined processes, insure comprehensive use of raw materials, flow technology, and a high level of mechanization of primary production processes. After the war, in connection with the enormous losses suffered by animal husbandry during the war, the meat enterprises built were mainly small, with shift capacities of 10-30 tons. As the raw material base developed, however, it became necessary to increase the size of enterprises. In the last five-year plan most of the meat combines built had capacities of 50-100 tons per shift, and today even larger plants are being built, capable of producing 150-200 tons of meat per shift.

As the capacity of enterprises increases, the cost of processing the main types of output (costs of production minus expenditures for materials) and specific capital investment decrease as follows (in percentage):

Capacity of Meat Combine for Meat Production, tons per shift	Cost of Processing One Ton			Specific Capital Investment (per ton of meat)
	A	B	C	
10	100.0	100.0	100.0	100.0
30	67.9	84.6	65.8	67.0
50	55.4	67.3	56.0	45.8
100	47.1	58.6	38.8	39.0

(A) Livestock, in live weight;
(B) Sausage Articles;
(C) Semifinished Products

The use of more productive equipment and setting up mechanized flow production at large enterprises makes it possible to attain a high level of labor productivity. If the output per slaughtering and processing worker present at enterprises with capacities of 10 tons of meat a shift is taken to be 100 percent, for enterprises with capacities of 30, 50, 70, and 120 tons per shift it will be 138.5, 148.3, 152.7, and 163.3 percent respectively.*

It is true that the distance livestock must be shipped increases with the construction of large enterprises, and this leads to a rise in transportation expenditures and greater losses of live weight. To avoid this the planning for construction of new enterprises and modernization of existing ones envisions capacities appropriate to drawing raw materials from a radius of no more than 100-150 kilometers. Shipping livestock such distances and rational organization of hauling in special-purpose trucks prevents loss of meat and fat en route and the additional shipping costs are more than compensated for by the savings in production costs. The table on the following page gives figures on the increase in costs for delivering livestock as shipping distance increases.

When enterprise capacities are raised from 50 to 100 tons per shift the average distance of livestock hauling increases 11 kilometers. Accordingly, costs of transporting to the meat combine go up about two rubles per ton. At the same time the cost of processing one ton of raw material at a larger enterprise is 3-4 rubles lower.

* See Kalita, L. A., "Kontsentratsiya Proizvodstva v Myasnoy Promyshlennosti" [Production Concentration in the Meat Industry], Izdatel'stvo Pishchevaya Promyshlennost', 1967, p 55.

Capacity of Meat Combine for Meat Production, tons per shift	Annual Capacity for Meat Production (400 shifts), in tons	Livestock Need, (50% meat output), in tons	Raw Materials Zone*, (density of 10 tons tons/km^2), in km^2	Radius of Livestock Shipping, in km	Average Distance of Livestock Haul, km
30	12,000	24,000	240	28	20
50	20,000	40,000	4,000	35	25
100	40,000	80,000	8,000	51	36
150	60,000	120,000	12,000	62	43
200	80,000	160,000	16,000	71	50

* The raw materials zone is assumed to be circular.

Meanwhile a tendency has been observed recently to build small enterprises to slaughter and process livestock right at the livestock complexes and interfarm enterprises. Agricultural enterprises have often built these meat combines to eliminate shipping the livestock. In Pugachevskiy Rayon of Saratovskaya Oblast, for example, the kolkhozes and sovkhozes built a (small) interfarm meat combine on share principles. It is experiencing serious problems in its operations, causing irregular meat supply. One of the kolkhozes in Brodovskiy Rayon of L'vovskaya Oblast, producing 15,000 quintals of pork a year, built a small meat combine at a cost of 680,000 rubles. At the same time the Ukrainian SSR Ministry of Meat and Dairy Industry is completing construction of a meat combine in the city of Stryy, 120 kilometers from the kolkhoz. This plant will have a capacity of 100 tons of meat per shift. Furthermore, there are other combines in L'vov, 105 kilometers from the kolkhoz, and in Rovno, just 60 kilometers away. Slaughter points are also being built in the Mari ASSR, the Uzbek SSR, and other regions. How big will these enterprises be? Will they be economical?

It should be kept in mind that even the largest hog feedlot, which feeds out 108,000 hogs a year, can only supply 300 head a day with evened-out delivery. To process this number of hogs takes capacities for only 10 tons a shift. Specific capital investment and operating costs at such enterprises are 2-2.5 times more than at a meat combine capable of 100 tons a shift. The construction of small enterprises at animal husbandry complexes is expensive and inefficient.

Managers argue that building slaughter facilities right at animal husbandry complexes eliminates livestock hauling costs, but they overlook the fact that there are additional costs in this case to deliver the finished products in refrigerator trucks, which are quite expensive to buy and operate. The construction of small slaughtering enterprises (there can be several thousand of them) will require enormous capital investment and production costs will be much higher than at enterprises with good equipment. Furthermore, building this type of enterprises would reduce the concentration of production, move away from the proven principle of combining operations, and lower production efficiency. It would create a number of serious difficulties with managing the enterprises of the sector. Meat is one of the group of funded food products; the distribution of meat resources must be strictly centralized. High efficiency in the production of meat products can only be achieved with modern enterprises using advanced technology with rational utilization of raw material and high labor productivity.

For the next 10-15 years the optimal capacity for a meat combine can be put at 100-150 tons per shift. In certain regions with a high density of livestock it will be necessary to build combines capable of 200-300 tons a shift. Construction of small (30-50 tons a shift) meat combines would be planned only in those regions where, owing to natural and economic conditions, animal husbandry is underdeveloped or the topography makes it impossible to ship livestock to the nearest meat combine.

The questions of specialization of production also must be solved in a new way. For many years the meat combine that slaughters and processes all types of livestock and produces various food, industrial, and special-purpose products has been almost the only type of enterprise in the meat industry. In recent years a new type of enterprise, the meat processing plant (MPZ) has received recognition. It produces sausage goods, semifinished meat products, and other meat items from the meat brought to the enterprise. The construction of such plants with capacities of 30, 50, and 100 tons a shift is highly efficient. An enterprise of this kind can supply meat products not only to the city in which it is located but also to nearby populated points in a radius of up to 100 kilometers. The savings on production costs will far surpass expenditures to deliver the meat products to their destinations. Building MPZ's in various oblast and republic centers will make it possible to eliminate the network of small, inefficient sausage shops at meat combines, that is, to turn these meat combines within the marketing zone of the MPZ into livestock slaughtering enterprises. The construction of slaughterhouses as subsidiaries of the meat combine should be done as close as possible to the raw material bases. This will promote the development of integration of the meat industry and agriculture.

The condition of the raw material base and organizing supply of raw materials to enterprises of the sector is a key factor determining the quantitative and qualitative work indexes of the meat industry. Solving the problems of increasing the volume of meat production and improving meat quality depends on the organization of animal husbandry. A paramount factor here is even supply of raw material for industrial processing. This has a significant effect on labor productivity.

Meat production and state purchases of livestock in our country are highly seasonal. Each month during the fall more than 10 percent of yearly livestock resources arrive at the meat combines; in the spring it is no more than 5-6 percent a month. The ratio of volumes of meat production in the months of the year with minimum load (May) and maximun (October) was 1:2 in 1977 (in 1970 it was 1:3). Moreover, delivery of livestock in the course of the month is uneven, which causes substantial equipment idle time, losses of work time, increased expenditures for processing livestock and storing meat, and larger capital investment related to the need to create reserve capacities for slaughtering and processing livestock and storing the meat in refrigeration units. If livestock slaughtering were evened out the enterprises of the meat industry could do the slaughtering and processing in two shifts (they usually work in one shift now) and work at least 500 shifts a year instead of the 350-400 now worked. This would greatly increase the return on capital.

The meat industry is working systematically to use raw materials more efficiently. All food resources from the slaughter and processing of the livestock are sent on for production of meat products. The industrial raw materials are used to produce dry animal feed, fats, drugs, and other articles. Nonetheless the sector has considerable reserves. The blood of the animals, which contains about 17 percent protein, is not being used adequately for food purposes. Not all the fat is extracted from the bones, and not all waste products are reprocessed to make animal feed. The questions of improving the quality of the leather raw material and other types of products have not been satisfactorily solved.

The issues of improving the organization of production and management are becoming very important. The continued advance of the meat industry demands establishment of clear-cut, harmonious mutual relations between the industry and agriculture to guarantee steady growth in supply of raw materials, improvement in their quality, rhythmic delivery, and drawing production as close as possible to the source of raw materials. In this respect, determining the forms of agroindustrial integration is one of the paramount challenges. The CPSU Central Committee and USSR Council of Ministers decree entitled "Measures to Further the Efficiency of Agricultural Science and Strengthen Its Ties with Production" suggested that ministries and department develop and economically substantiate rational forms of interfarm cooperation and agroindustrial integration.

The economic relations between the meat industry and agriculture today are based on advance contracts. These are contracts for the purchase of livestock in volumes set by the state purchase plan. Experience has shown that this system does not achieve stable, rhythmic delivery of livestock. Advance contracts are not effective at all. The meat industry has no leverage to exercise with respect to its suppliers. As a result, there are strong elements of spontaneity in the meat industry, which leads to frequent violations of production plans.

It is evident that there is no one simple solution to this problem. Each sector of industry and agricultural production should apply those particular forms of concentration and integration that fit the specific characteristics of their sector. Whereas it is feasible and expedient in the system of the USSR Ministry of Food Industry, where small enterprises located in the rural areas near the sources of raw materials predominate, to organize sovkhoz-plants and combines and agroindustrial combines, this form is hardly acceptable for the meat industry. It must be kept in mind that the meat industry includes a large number of large enterprises who receive raw materials from numerous sovkhozes and kolkhozes, as well as from kolkhoz members, workers, and employees who keep livestock and poultry in their own private plots. The enterprises are mainly located in cities, often far from the farms that provide them with raw materials. Moreover, the process of specialization of animal husbandry is in its initial stage, and meat industry enterprises are also receiving deliveries of raw materials from general kolkhozes and sovkhozes. Under such conditions the problem of integrating animal husbandry and the meat industry must be solved by stages with due regard for peculiar circumstances.

The first stage is the period of drawing the enterprises and livestock farms closer by expanding direct ties among them. The first thing that must be done is to assign the enterprises (associations) sovkhozes and kolkhozes within a zone of 100-150 kilometers for direct supply of livestock. It is advisable to establish relations with the assigned farms on the basis of direct ties without the mediation of procurement organizations. Advance contracts should be concluded by enterprises and organizations of the meat industry directly with the livestock farms.

To strengthen direct ties the meat enterprises must complete the transition to accepting livestock from the farms by weight and quality and institute this procedure for acceptance of poultry. At the present time more than 80 percent of the livestock received at meat combines are accepted on the basis of meat weight and quality. The advantages of this procedure are that it gives a reliable determination of the amount and quality of the final product of animal husbandry -- the meat, and it heightens the interest of livestock farms in improving the quality of the raw material. Delivery of livestock from the livestock farms should be organized using special meat industry trucks following strict daily and hourly timetables with material stimulation for the employees of animal husbandry farms for rhythmic supply of livestock. It is advisable to organize the hauling of raw material from the farms in a centralized manner with trucks from specialized motor pools. The work experience of the large motor pools of the meat and dairy industry has demonstrated that their trucks are twice as productive as those at small motor pools and the prime cost of deliveries is 50-70 percent lower.

The subject matter of advance contracts should be expanded and deepened in order to establish close production ties between the meat industry and livestock farms. It is essential that the contracts provide for other obligations in addition to obligations related to state purchases.

For meat industry enterprises (associations) they should include: slaughter and processing of all livestock raised (fed out) by the farm both for state purchase and for its own needs; hauling the stock from the farms to the meat combine in its own transportation; acceptance and payment at set prices for all meat designated for sale to the state (according to plan and above the plan of state purchases); production of a definite quantity of meat products (sausage goods and the like) from meat that belongs to the animal husbandry enterprises; storing meat belonging to the livestock farms in refrigeration units; delivering the meat and meat products belonging to the livestock farms (above that sold to the state) to the farms in its own transportation; production of livestock feed products from production waste products (meat-bone and blood meal, whole milk substitutes for calves, and the like) and turning part of it over to the livestock farm at set prices.

For the livestock farms the contract should envision obligations to turn over to the meat combine all slaughter livestock raised (fed out) at the farm according to agreed-upon timetables; sale to the state of a definite amount of meat (above the state purchase plan) at set prices; holding livestock at the farm before slaughter using existing technology, and so on.

In cases where the meat combine does not have the necessary capacities, the advance contract may provide for the livestock farm to participate in financing construction of slaughter enterprises with the status of subsidiaries of the meat combine. Meat processing plants, refrigeration units, recycling plants, and others may be built on the same principles. The principles of concentration and specialization of production must be followed strictly here. A council composed of authorized representatives of the cooperating farms and an employee of the meat combine should be formed to monitor performance of the contract and given the right to monitor the activities of the livestock farms and meat combines.

A special material incentive fund to pay bonuses to farms that achieve high indexes for fatness of meat, evenness of deliveries, and the like in order to give the livestock farms a greater material interest in turning over high-quality livestock and meeting delivery timetables should be created at meat industry enterprises. The amounts of bonuses should be set by the above-mentioned council. This preserves the economic independence of the meat industry enterprises (associations) and the livestock farms.

The management of state purchases of livestock also requires refinement. At the present time state purchases are made by procurement agencies of the Ministry of Agriculture in some republics (the RSFSR, Kazakhstan, and others) and by the associations and enterprises of the Ministry of Meat and Dairy Industry in others. Experience has shown that state purchases of livestock made directly by meat industry organizations are more efficient. Integration ties between the meat industry and agriculture will be promoted by realization of the decision, taken by the July 1978 Plenum of the CPSU Central Committee, to put an end to the multiplicity of plans for state purchases of agricultural products and establish, beginning with the 11th Five-Year Plan, one highly demanding but realistic plan for each entity for the five years with breakdown by years.

In the last decade the practice of paying livestock suppliers according to the weight and quality of meat obtained at meat industry enterprises after slaughtering the livestock has been widely used. Most livestock turned over to the state today are recorded by weight of meat. But the planning for state purchases of livestock continues to be done in live weight. Because the livestock are not weighed when turned over to the enterprises, their live weight is determined artificially on the basis of set coefficients. This method of determining live weight is inaccurate (the coefficients are stable, but the output of meat has a tendency to rise) and often creates conditions where it is to the advantage of the livestock farm to turn over undernourished livestock to the state, since with calculation at higher coefficients their live weight will be higher. Planning state purchases by weight of meat would give the farms an interest in improving the meat qualities of the livestock.

At the present time about 10 percent of state purchases of livestock comes from kolkhoz members, workers, and employees. It would be wise to give the kolkhozes and sovkhozes the jobs of buying livestock from the population for subsequent feeding out and sale to the state. The process of improving integration ties among the sectors of the agroindustrial complex demands development of transportation, wholesale marketing, and retail trade. There are numerous problems to be solved in strengthening the material-technical base of the elements and creating strong ties with agriculture and the meat industry.

The nature of livestock shipping has changed radically in the last 10-15 years, as the table below shows.

Table. Transportation of Livestock and Poultry (%)

	Total	Including, by		
		Rail	Truck	Drive
1960	100.0	27.4	29.6	43.0
1970	100.0	19.0	69.2	11.8
1976	100.0	9.8	86.1	4.1

Livestock are delivered by rail only for long trips, to Moscow, Leningrad, and other points. Hauling by truck has become the prevalent form. Therefore, it is very important to supply meat industry enterprises and specialized motor vehicle organizations with trucks for hauling livestock (two-level livestock trucks with trailers, isothermic trucks for transporting meat products). Carrying out the decree of the July 1978 Plenum of the CPSU Central Committee on setting up production of large-capacity and special-purpose trucks for agriculture. Expanding the scale of work on building vehicular roads is an important condition for solving the problem of shipping agricultural freight.

Meat storage is a problem that requires special attention in the area of wholesale marketing of meat products. A situation has developed historically where the distribution refrigeration facilities are concentrated chiefly in the centers of consumption, and meat must be shipped long distances to them. Because of the impossibility of immediately shipping meat out of the production regions given the seasonality of production, meat industry enterprises have been forced to store seasonal stocks of meat in their own refrigerator units, which diverts considerable capital investment. Therefore, considerable attention must be given to building new distribution refrigeration units and expanding existing ones, primarily in the raw material regions, in order to free production refrigerators as much as possible from the need to store seasonal stocks of meat.

Comprehensive solutions to the problems of improving animal husbandry, industrial processing of livestock and production of meat products, transportation and storage of them, and wholesale and retail trade, will create conditions for continued progress in integrating all elements of the meat supply system.

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CSO: 1824

REGIONAL DEVELOPMENT

KAZAKHSTAN ANTICIPATES LAST YEAR OF FIVE-YEAR PLAN

Alma-Ata SEL'SKOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 1, Jan 80 pp 2-3

[Lead article: "From Today's Achievements to Tomorrow's Achievements"]

[Text] The Soviet people have entered into the final year of the Ninth Five-Year Plan in good spirits, with confidence and optimism. As they look back on the road traveled last year, they see with the greatest pride in their great homeland that our country has made another large step in its progressive advance toward communism. Through the efforts of the nation's working people, there has been further growth of the economic power of our beloved homeland. The annual plan for production, which was established by industrial associations and enterprises, has been overfulfilled. Workers in the fields of energy, instrument building and gas production performed with excellence. The worker groups in such sectors as heavy and transport, tractor and agricultural, chemical and petroleum machine building, the light and food industries have worked well.

"Much was achieved and accomplished this year by our people, in industry and construction, in agriculture, in the sciences and culture," stated L. I. Brezhnev at a reception at the Kremlin Palace in honor of the 62d anniversary of the Great October Socialist Revolution.

The people of Kazakhstan are also very pleased with the accomplishments of the past year. The fields of our republic have become heavier and more fruitful; there has been an increase in livestock products. But particularly outstanding accomplishments were made in the production of grain.

The farmers of Kazakhstan have poured over 1 billion 261 million poods of high quality grain into the granaries of the homeland, 1 billion poods of which consisted of the most valuable food crop, wheat. There has never been such a harvest before in the history of agriculture of this republic.

What enabled, for example, the Chervonnyy Sovkhoz in Kokchetavskaya Oblast and other farms in the republic to achieve a rich harvest?

As shown by experience, the foundation for this achievement was laid as far back as the fall of the year before last. The fields were plowed immediately after harvesting in the fall, within a very short time over the entire area, and the work was done well. In the winter, 40-60 cm of snow was built up over all areas where spring grain crops were to be planted. For this purpose, snow retention work was done 2-3 times. Concurrently, seeds were prepared and brought up to a high sowing quality, and sowing equipment was overhauled. The planting was done at the optimum agrotechnical time, and the quality of the job was very high. Harvesting was just as well organized and made use of the latest technology. The farms in Severo-Kazakhstanskaya Oblast obtained an average of 18 centners per hectare of grain crops and those in Tselinogradskaya Oblast harvested 16.2 centners. Dozens of rayons, hundreds of sovkhozes and kolkhozes raised and harvested 20 or more centners per planted hectare. For example, the tractor-borne field crop grower brigade headed by V. Ye.Kirichok, Hero of Socialist Labor, from the Chervonnyy Sovkhoz in Kokchetavksaya Oblast, harvested 24 centners per hectare of choice grade wheat over an area of 5100 hectares, having assumed the obligation of producing 21 centners; it was the first at that farm to finish harvesting grain crops. The sovkhoz harvested 22.8 centners grain per hectare.

As we know, Kazakhstan was awarded a fourth order, the Order of Lenin, for its major achievements in increasing grain production.

The high goal of the republic with regard to grain procurement will be reached by the intensive struggle of grain growers of Kazakhstan to consistently improve the welfare of the Soviet people, to refine agriculture and, first of all, to improve grain production.

Last year was difficult, very difficult for the field workers. The agronomists, technologists of the fields, spent many anxious days and nights worrying about the fate of the harvest. Making use of their abundant knowledge about raising grain crops on formerly virgin land, the recommendations of scientific research institutions and experimental agricultural stations, they tried to mobilize the grain growers to overcome the inclement weather. And, it must be stated that in most cases they coped well with the responsible tasks of raising and reaped an unprecedented harvest.

Again and again, the agronomists and heads of departments studied the technology used to grow grain crops. They analyzed what was done wrong, what should be refined and improved. They explored why wheat lodged earlier in some fields than others, why rust and smut were more severe in some tracts and why the grain was damaged. They investigated whether all factors had been considered in setting sowing dates: Was there optimum stem density? What was the result of using a fertilizer preparation in the fall to treat seeds and in the spring to treat the crops? In a word, they had to find out everything that determined the maximum success and what caused some unwarranted expenses here and there. For it is apparent that not a single self-respecting agronomist could justify a harvest shortfall only by the inclement weather. It is quite obvious that each of them persistently sought for causes depending on technology that led to a shortfall in bad weather; and that each did everything possible to avoid their recurrence in a similar situation.

What a lesson the weather taught us last year with regard to selection of cultivars! We could have fretted ad infinitum about the fact that plant breeders have not yet developed a cultivar resistant to lodging and excessive humidity, drought, one that would be hardy, insusceptible to diseases, particularly rust and smut. Evidently, this would be unfounded. For it is difficult to fault them for the fact that we still do not have a cultivar that is resistant to all agrotechnical infractions.

As shown by life, experienced and educated agronomists are attentively studying and selecting cultivars of the intensive type to obtain more fertile fields, the best precursors and for different doses of fertilizers. On those fields where all these conditions cannot be met as yet, the hardier varieties of grain crops assigned to the local rayons are being planted and they will yield the largest harvest there. And nothing will be lost.

For it is known that a cultivar by itself cannot express its best qualities if appropriate conditions are not provided for it. And what are these conditions? This is precisely the area that an agronomist who knows the distinctions of this or another cultivar should work on. The better these conditions are met by the grain growers, the more vividly and comprehensively the positive properties of each cultivar will be revealed, and the larger the harvest obtained.

The farmers of Kokchetavskaya, Turgayskaya, Pavlodarskaya, Aktyubinskaya and other oblasts of this republic reaping a large harvest of grain crops under the difficult weather conditions of last year.

A meticulous study of the knowhow of leading farms in these and other oblasts, sophistication of agriculture and its distinctions there constitutes an important task for all grain growers in this republic. It is equally important for this knowhow to be rapidly disseminated and then introduced on a broad scale to all sovkhozes and kolkhozes. Ultimately, this will result in consistent refinement of agriculture and the fields will build up strength with each year, yielding a stable harvest of at least 20 centners per hectare, as recommended to the farmers of our republic by L. I. Brezhnev, general secretary of the CC CPSU and chairman of the presidium of the USSR Supreme Soviet.

The accomplishments achieved in grain production are perceptible, but it would be wrong to believe that we have reached the top.

There is still much unevenness in harvests in our country. It is by far not always that progressive technology is used to cultivate grain crops, not only in different rayons but farms that are similar in natural and economic conditions. Some of the shortfall in agricultural products reaped by the farms in this republic are attributable to the fact that there is not a vigorous enough struggle for refining production, controlling diseases and pests of agricultural crops.

In entering into the national socialist competition, the agricultural workers of Kazakhstan are taking on the obligation of working even more persistently in the last year of the current five-year plan to secure and excell the indices achieved in development of grain production in the fourth year of the five-year plan, to apply every effort to plant and raise on their fields an abundant harvest of all agriculture crops, and first of all grain crops. This is eloquently illustrated by the recently published appeal of the farmers in the Irtysh River region of Pavlodarskaya Oblast to all rural workers in the republic to augment even more the fertility of the fields, to make fuller use of reserves and to reap an abundant harvest in 1980, as well as to not only secure but further multiply achievements on the basis of continued intensification of production and refinement of agriculture.

The machine operators of the Irtysh River region of Pavlodarskaya Oblast decided, on the basis of analysis of the existing capabilities and reserves, to overhaul tractors and soil cultivating equipment by no later than 15 April and to complete repairs of haying equipment by 25 May. All of the grain harvesting combines and reapers must be on the starting line by 20 July.

The appeal of the Pavlodar grain growers is gaining increasing support of the farmers of this republic. It is the duty of supervisors and specialists of farms, Party and trade union organizations of sovkhozes and kolkhozes to see that each farmer is aware of this appeal, to outline specific measures for the farms to augment agricultural production and, first of all, grain production.

The initiative of sovkhozes and kolkhozes that decided to increase the area planted with sorghum, a drought-resistant crop that is responsive to a good soil, as well as peaks, millet, buckwheat, corn, soybeans and other high-protein crops, also merits every support.

It is noted in the socialist obligations assumed by farms, rayons and oblasts for the final year of the five-year plan that it is only by means of intensification that new advances can be made in development of agriculture and the livestock industry.

Comrade D. A. Kunayev, first secretary of the CC of the Kazakhstan Communist Party, member of the CC CPSU Politburo, stated at a meeting to greet L. I. Brezhnev, general secretary of the CC CPSU, in connection with the outstanding victory of grain gorwers of Kazakhstan and bestowal of the Order of Lenin upon Kazakhstan: "A billion [tons] of Kazakhstan grain should be the annual norm." The farm workers of this republic must assure full scale production of rice, vegetables and potatoes, as well as industrial crops.

There are also some responsible tasks before the livestock breeders of this republic. In spite of the fact that there has been some improvement in the situation last year, they should persistently continue to raise the level of development of all sectors of the livestock industry, increasing the milk yield per cow, weight gain of all species of livestock and poultry and productivity of labor. This year, the livestock breeders of Kazakhstan must be bolder and more decisive in introducing intensive methods of management, and they should be bolder in moving to industrial tracks for the production of meat and milk. It is an urgent task to remodel and refurbish existing farms on a broad scale. It is the duty of animal breeders of this republic to follow the example of the leading farms and obtain results from fattening livestock and delivery to the nation of livestock with an average live weight of at least 400-450 kg for cattle, 100-105 kg for hogs, 40-45 kg for sheep. But the most immediate job for animal breeders now is how the livestock will spend the winter.

The instigators of the republic's competition among animal breeders for exemplary results are the workers at the farms of Karagandinskaya Oblast, who decided to increase the production of meat by 7%, milk production by 5.2%, egg production by 4% and wool by 8%, as compared to the 1979 plan. At the same time, they want to increase the number of all species of livestock and poultry.

This can be achieved only by organizing intensive fattening of animals, so that the daily weight gain of cattle would be 450-500 or more g during the period that they are still growing, at least 800-1100 g when they are being fattened, 500 g for hogs, bringing the mean weight of cattle at the time of delivery up to 300-420 kg.

Well-substantiated plans are also backed up by the high obligations of animal breeders in other oblasts.

It is the duty of supervisors and farm specialists, as well as those of Party and trade union organizations, and all animal breeders in the republic to back these lofty obligations up with proper material and technical supplies, to reinforce them with persistent organizational work, selfless labor and creative initiative, detection and full use of all production reserves.

In the final year of the 10th Five-Year Plan, the rural workers of this republic should be governed by the slogan: "To deliver to their homeland more grain, meat, milk and other products of high quality."

The administrators and specialists of sovkhozes, kolkhozes, management bodies, primary Party and trade union organizations must take vigorous steps for comprehensive deployment of socialist competition, orientation thereof toward improving the quality of production and efficiency on all levels thereof, with successful fulfillment of successive plans.

Their first and foremost duty is to offer every support and to disseminate progressive knowhow, progressive ways and means of working that would be instrumental in increasing the productivity of labor.

Party and trade union organizations, administrators and specialists of management agencies must concentrate on enlisting the working people to fulfill the tasks of the final year of the current five-year plan, to create a firm foundation for the 11th Five-Year Plan.
[192-10,657]

10,657
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REGIONAL DEVELOPMENT

UPDATE ON CROP AND LIVESTOCK SITUATION IN KAZAKHSTAN

Alma-Ata SEL'SKOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 1, Jan 80 pp 4-5

[Article by M. Motoriko, Minister of Kazakh Ministry of Agriculture: "Glorious Accomplishments and Major Tasks"]

[Text] The agricultural workers and all workers of Kazakh SSR, who have broadly deployed a socialist competition for implementation of the decisions of the 25th Party Congress, July (1978) plenum of the CC CPSU, soviets and instructions of comrade L. I. Brezhnev, general secretary of the CC CPSU and chairman of the presidium of the USSR Supreme Soviet, dealing with continued advancement of agriculture, did much work last year and made significant advances in the production of agricultural products. This enabled a number of sovkhozes and kolkhozes to strive not only to fulfill, but overfulfill the plans and socialst obligations pertaining to the sale to the government of agricultural and livestock products.

Much was accomplished in 1979. That year became an important stage in our labor march to the end of the 9th Five-Year Plan. The grain growers of this republic have made particularly great strides. A good harvest of grain crops was raised and reaping was well-organized. Outstanding achievements were attained in the production and sale of grain to the government. A record amount of grain was harvested: 33.7 billion tons. More than 1 billion 261 billion poods of high-quality grain was sold to the government, which is 321 poods more than specified in the plan. This is the first time that so much grain was reaped and processed in Kazakhstan! More than 16 million tons, or 1 billion poods, of wheat, the main food crop, were poured into the State granaries. Of the total amount purchased by the State, 70% was referable to hard, sturdy and valuable varieties. This republic's sovkhozes and kolkhozes have taken full care of their needs for high-grade seeds, and they have created the necessary food and fodder stock.

All of the oblasts in this republic overfulfilled the planned levels of grain sale to the State. The farm workers of Kustanayskaya Oblast, who sold the State 229 million poods, Tselinogradskaya Oblast, who sold 204 million poods, Kokchetavskaya Oblast who sold 142 million poods and Turgayskaya Oblast, who sold 118 million poods, made a major contribution to augmenting the grain resources. The farms in Severo-Kazakhstanskaya Oblast coped well with their obligations, having delivered 101 million poods to procurement centers, those in Pavlodarskaya Oblast delivered 61 million poods, Karagandinskaya Oblast--66 million poods, Ural'skaya Oblast--61 million, Aktyubinskaya Oblast--49 million, Dzhambulskaya Oblast--33 million and Semipalatinskaya Oblast--32 million poods. The sales figures for workers in other oblasts were as follows: 31 million poods from Vostochno-Kazakhstanskaya Oblast, 31 million from Chimkentskaya, 31 million from Taldy-Kurganskaya, 21 million from Alma-Atinskaya, 19 million from Kzyl-Ordinskaya and 9 million poods from Dzhezkazganskaya Oblast.

The annual mean grain production in this republic constituted 27.2 million tons and exceeded the level planned for 1980! For the third time under the 10th Five-Year Plan, Kazakhstan has sold the State over a billion poods of grain per year. The volume of grain purchases established for a 4-year period was overfulfilled. All 17 oblasts of this republic (out of 19) that produce grain overfulfilled the national economic plan for grain purchases.

The record achieved by the farm workers in grain procurement, so to speak, closed the books for the first quarter century since the virgin land was developed, and opened those for the next quarter century. In 1954-1979 the republic processed a total of 290 million tons of grain, and many other agricutlural products.

The farm workers of formerly virgin land attained exceptional accomplishments. They devoted much work and concern to raise such an amount of grain. We imagine that 1979 was a year that made demands of them, like none other, to enlist their maximum strength, experience, knowhow, speed and excellence of work.

The wide scope of socialist competition was instrumental in the successful completion of 1979 harvesting. As always, it was headed by communists. Through their personal example and impassioned words, they drew people to follow them, they did everything to strengthen the desire in each individual to work to his utmost capacity.

Comrade L. I. Brezhnev, general secretary of the CC CPSU and chairman of the presidium of the USSR Supreme Soviet, congratulated the workers of Kazakh SSR on their outstanding accomplishments. He stressed: "The force of virgin lands was manifested once more by these achievements. A major base for the production of marketable grain was created in Kazakhstan by the will of the Party and heroic labor of the Soviet people."

The Order of Lenin was bestowed upon Soviet Kazakhstan by ukase of the presidium of the USSR Supreme Soviet.

The farmers of Kazakhstan accomplished a great feat. The grain they have grown is particularly valuable in this difficult year, when the fields of some parts of our country were the victims of the most severe drought. But this harvest is important not only in terms of tons and poods. The grain grown on formerly virgin land is the result of the wise and far-sighted Party policy directed toward development of new territory and systematic intensification of production. The grain raised in formerly virgin lands is the result of the labor of millions of people, those who came to help the Kazakhstan people, produced the technology and delivered fertilizers.

By virtue of the active cooperation of science, broad use of progressive methods of soil cultivation and effective methods of organizing labor, agriculture in this virgin land has risen to a new level.

"The ancient steppe turned out to be heroic," writes L. I. Brezhnev in his book of recollections, "The Virgin Lands." "Transformed by the labor of man, it has given stability to our entire agriculture; it has provided a guarantee that the required amounts of grain will be produced. And this land is gaining strength."

Success became possible thanks to the tireless labor of farmers, militant organizational work of Party, soviet and business bodies. A remarkable cohort of grain growers developed and matured in the virgin land. During the hot years of struggle for the harvest of 1979, they confirmed once more their skill and loyalty to the heroic traditions of the original participants in development of virgin soil. The names of thousands of progressive workers are linked with that heavy work. Among those who attained outstanding achievements are the following: combine operator A. Dide, who threshed 24,600 centners of grain crops; V. Daniletskiy, machine operator of Kustanay, who delivered, with the help of his comrades, 56,800 centners of grain from the bins of three "Niva" installations; V. Shevtsova, member of the office of the Komsomol'skiy Raykom in Kustanayskaya Oblast, who is personally responsible for delivery of 15,600 centners of wheat; and M. Khasenova, combine operator at the Krasnoflotskiy Sovkhoz in Kokchetavksaya Oblast, the mother of 6 children, who threshed 10,400 centners of grain. Among the leading workers who forged a victory on the grain fields of Kazakhstan are: Dzhamshit Kozhantayev, Hero of Socialist Labor, a driver from the No 2585 motor transport column in Shchuchinsk, Kokchetavskaya Oblast; Kamshat Donenbayeva, Hero of Socialist Labor, deputy to the USSR Supreme Soviet, machine operator from the Khar'kovskiy Sovkhoz in Kustanayskaya Oblast; and Aleksandr Kazachenok, Hero of Socialist Labor, a team leader from the Krasnosel'skiy Sovkhoz imeni B. Maylin in Kustanayskaya Oblast. The brothers, Pavel, Aleksandr and Anatoliy Postnikov worked well on the reaping of the harvest at the Sovkhoz imeni S. M. Kirov. Hundreds of other machine operators, drivers, processers and railroad workers presented examples of valorous labor.

The workers of Kazakhstan have made a large step toward implementing the decisions of the 25th Party Congress and July (1978) plenum of the CC CPSU.

Now it is important to secure what has been achieved, to attain further increase in effectiveness of agricultural production. We refer, first of all, to the consistent increase in grain harvest. All of the conditions are present in this republic to fulfill the task set forth by the Party: to augment the mean grain harvest to 20 or more quintals per hectare. The experience gained this year has demonstrated once more the feasibility of such plans. Several of the virgin regions have already advanced to this level, and some farms have exceeded it significantly. The brigade of the Voskhod Sovkhoz, in northern Kazakhstan, headed by A. Shovdin, raised 30.9 quintals of grain on each of more than 4000 hectares.

Reaping the grain crops was performed very rapidly and in an organized fashion; the workers also coped well with the socialist obligations on the sale of grain to the State from farms in Chimkentskaya and Dzhambulskaya oblasts. A good rice harvest was obtained in Kzyl-Ordinskaya Oblast, which is also fulfilling its socialist obligations well.

It is not by chance that such an abundant harvest was reaped. Long years of intensive and creative labor were required to withstand the drought,and introduce a soil-protection system of agriculture in virgin land, which was developed by agronomic science of Kazakhstan. The farmers are in close contact with experimental stations and scientific research institutes. Seed growing has been put on a scientific basis. The country has supplied modern technology to the farmers. Today, the sucess of grain growing also depends on the skill of field workers, their knowhow, persistence and organization, rather than only summer rains, as was believed recently. And, of course, the success was the result of persistent implementation of the long-range complex program for development of socialist agriculture developed by the Party. Actually, the entire nation reaped the grain of Kazakhstan. Groups from industrial enterprises and construction projects, educational institutions, motor transport subunits [podrazdeleniya] of the Soviet Army, pilots in the agricultural aviation, as well as machine operators who came from the RSFSR, Ukraine, Azerbaijan, Moldavia and Belorussia.

And the grain growers of Kazakhstan express their sincere gratitude to all those who participated in reaping the 1979 harvest!

It is rewarding to see that there have been accomplishments not only in the production and procurement of grain. Quite a good harvest of sugar beets, cotton and rice has been raised and harvested in this republic.

Much has been done to augment potato and vegetable production. We should like to mention the great work done by the vegetable growers of Karagandinskaya Oblast, as well as at the farms in Alma-Atinskaya, Chimkentskaya and Dzhambulskaya oblasts.

At the same time, when speaking of achievements, we should not relent in our attention to widening of the assortment of vegetable production, as well as meeting more fully the needs of the public with regard to diverse products.

Animal breeders are presently solving some responsible and complex problems. In the years of the current five-year plan, some positive changes have occurred in this sector: increased production and larger number of animals. As compared to the corresponding period of the last five-year plan, the animal breeders increased meat production by 122,000 tons, milk by 1,110,000 tons, wool by 10,700 tons and eggs by 2832 million in the 3 years and 9 months of the current five-year plan.

In only 3 of the years of the 10th Five-Year Plan, sales to the State exceeded the plans by 111,000 tons for milk, as well as by 267 million eggs and 12,000 tons of wool.

The farms in Kustanayskaya, Severo-Kazakhstanskaya, Tselinogradskaya and a number of other oblasts have increased significantly meat production.

The mean weight per head of cattle delivered to the State for butchering has reached 401 kg, the figures being up to 443 kg in Kustanayskaya Oblast 411-416 kg in Kokchetavskaya, Ural'skaya and Tselinogradskaya oblasts. Delivered hog weight constitutes 103 kg and sheep weight 39 kg.

Last year, there was an increase in number of cattle, hogs and fowl.

Considerable work has been done to strengthen and technically transform animal breeding sectors, putting them on an industrial footing. At the farms in this republic there are 54 complexes in operation for the production of milk with a capacity of 50,000 cows; 7 complexes for raising and fattening cattle with a capacity of 46,000 head; 164 specialized associations raise and fatten cattle on a cooperative basis with the participation of 1275 farms.

The sovkhoz imeni Pravda newspaper is achieving high and stable indices for meat production each year; this sovkhoz is in Ural'skaya Oblast and it delivers 5000 head of young cattle per year, with an average weight of 500 kg per head. The "40 Years of October" kolkhoz in Taldy-Kurganskaya Oblast delivers fattened sheep weighing 50 kg each, and up to 80% of the animals are graded as very well-nourished.

At the same time, the level of development of the livestock industry as a whole in the republic is still inadequate. It is a matter of honor for the animal breeders to strive for dynamic and stable development of this sector, to increase milk yield and weight gain, to augment the productivity of labor, and to increase from day to day the amount of meat, milk and other products sold to the State.

There are some important frontiers for animal breeders to reach in 1980. Introduction of intensive methods of animal breeding management, a change to industrial methods of milk and meat production, broad reconstruction and technical re-equipment for these purposes of all functioning farms--all this is an important task for all workers in this sector, as well as supervisors, specialists and all kolkhoz and sovkhoz workers.

As they enter into the last year of the current five-year plan, the animal breeders are assuming serious socialist obligations, the main prerequisite for which is strengthening the feed base. With this in mind, the sovkhoz and kolkhoz workers of Kazakhstan did much work in 1979: they procured over 26 million tons of hay, haylage and straw; manufactured 209,400 tons of grass and vitamin meal, stored 19.3 million tons of silage, and stocked up over 5 million tons of grain forage. At hundreds of farms, a 1.5-2-year supply of feed has been produced. This is the first time that such an amount has been stored.

Much has been done by the rural builders of Kazakhstan. Today, they are determining the fate of our villages, and the image of the villages and auls is changing from year to year thanks to their efforts: modern buildings on village streets, growth of industrial type installations. Large livestock breeding complexes, schools, hospitals, clubs and nurseries [for children] have become typical features in the modern village landscape.

A total of 1,110,000 square meters of residential housing has been erected and occupied; new standard types of general education schools with space for 16,000 pupils, nurseries with space for 3600 and clubs with space for 3000 have been put in operation. Many new livestock buildings and granaries have been put in operation. New libraries, hospitals, stores and other public service facilities have been opened.

The agricultural year has ended. But intensive work continues on the kolkhoz fields and farms. The farm workers of this republic consider their main task to be not only to strengthen, but develop the achievements of the fourth year of the 10th Five-Year Plan. It is imperative to exceed the results obtained on the basis of progressive knowhow and scientific achievements, to provide for stable development of all sectors of agriculture, growth of harvest and gross yield of all forms of products and raw material, with mandatory fulfillment of the assignments for the final year and the five-year plan as a whole.

The main factor for us is comprehensive build-up of grain production. It is expressly grain that determines the level of all our work in rural areas. The farm workers of Kazakhstan are confronted with the task of obtaining stable production, to raise the grain harvest to at least 20 quintals per hectare within the next few years.

There is still much to be done in the area of of the livestock industry. The July plenum of the CC CPSU defined as the first and foremost task that of increasing meat production. To do this, along with increase in number of animals, there must be a significant increase in productivity of livestock and fowl, as well as a change to intensive methods of running the livestock industry.

Additional steps must be taken to improve fattening and grazing of animals, to see that each farm would deliver for slaughtering livestock having the following mean weight per head: at least 400-450 kg for cattle, 40-45 kg for sheep and 100-105 kg for hogs.

Special attention must be given to further development of beef cattle breeding, hog breeding and poultry farming, as well as searching for and putting into action all of the reserves and capacities to augment the productivity of livestock and strengthen the feed base.

The republic is faced with the task to raise the number of sheep to 50 million head. To do this, it is imperative to increase significantly the stock of ewes and the share of ewes in flocks by at least 65%, and up to 70% at farms that raise sheep for mutton and lard.

Our duty is to make every farm profitable and to make every sector profitable at the farms.

At the present time, everything is being done to achieve considerable production of agricultural products in 1980. This is our duty and great obligation. It will be our worthy gift for the 110th anniversary of the birthday of V. I. Lenin, 60th anniversary of Kazakh SSR and the Communist Party of Kazakhstan.
[192-10,657]

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AGRO-ECONOMICS AND ORGANIZATION

ECONOMIC ASPECTS OF SCIENTIFIC AND TECHNICAL PROGRESS IN AGRICULTURE

Moscow VOPROSY EKONOMIKI in Russian No 12, Dec 79 pp 124-134

[Article by Ivan Nikolayavich Buzdalov, doctor of economic sciences, senior scientific associate, Institute of Economics of the World Socialist System of the USSR Academy of Sciences; and by Aleksandr Andreyevich Semyenov, candidate of economic sciences, docent at Kubanskiy Agricultural Institute: "Scientific-Technical Progress and the Effectiveness of Agricultural Production"]

[Text] In the attainment of the higher goal of societal production under socialism, a major role is assigned to the further intensive development of the productive forces of agriculture, and to their efficient use in relation to contemporary achievements of science and technology. The acceleration of scientific-technical progress is the decisive factor in the development of all fields and spheres of economics In agriculture, where the implementation of basic technical retooling of production and the mastery of industrial technology are imminent, this acceleration looms as one of the primary directions of the party's agrarian policy. The widespread introduction of the gains of science and technology into agricultural production is the precondition, not only for the increasing of its economic effectiveness, but for providing modern, progressive changes in social reconstruction of the farm community, and for fulfilling overall projected tasks of communist development.

As an expression of qualitative changes in productive capabilities, which evoke the objective necessity for improving production ratios, scientific-technical progress constitutes a complex issue. In agriculture, where natural biological factors serve as "active" motive forces of the reproductive process, scientific-technical progress has its particular applications. A wide range of measures which predetermine progressive changes in tools and related articles of work (primarily in machine technology), in production technology, organization, and control, and in increasing the cultural-technical level and improving the social conditions of work for farm workers, needs to be maximally applied to a qualitative improvement of the aforementioned factors and to increasing the economic productivity of land and cattle.

The particularity of NTP [scientific-technical progress] in agriculture consists in the fact that the material basis of its critical trends (mechanization, electrification, automation, chemical applications, selective breeding, commercial feed-production, microbiology, highway system reconstruction, etc), is built outside the limits of the field itself. Thus, scientific-technical progress in agriculture emerges as a vast, inter-field, national-economic problem, as a problem of the systematic, balanced development of the country's entire agroproduction complex.

The complex utilization of factors of scientific-technical progress presupposes the segregation, for each given stage and specific production-economic situation, of main components, main directions of scientific-technical progress among which are--transformation of the material-technical base, industrialization of agricultural production, chemical applications to agro-production, and the further development of reproductive selection of crops and livestock. On this basis is established the capability of a mass transition to the machine system and to complex technological, industrial systems which include the interrelated utilization of technical, chemical biological, and organizational-technological factors of scientific-technical progress.

V. I. Lenin, defining the essence of technical progress in political-economic thought, noted that it is expressed in a regular diminution in the relationship of "variable capital to constant."* In a practical sense, in agriculture as well, this general regularity expresses itself in an enlargement of the technical, and consequently, the organic framework of production, and in an increase in the quota of past work invested in the means of production.

Scientific-technical progress is a crucial prerequisite for the realization of intensification of agricultural production, and in the growth of efficiency of supplemental and joint investments in land. Lenin emphasized that, ".. the very concept, 'supplemental (or subsequent) investments of labor and cpaital' /presupposes/ [in italics] a change in the means of production, and a transformation of technology. In order to increase to a significant extent the amount of capital invested in land, it is necessary to /acquire/ new machinery, new systems of crop production, new methods of livestock maintenance, product transport, so on and so forth .. "**
Consequently, an acceleration of scientific-technical progress in agriculture presumes the growth and concomitant qualitative improvement of machine technology and its efficient use within the limits of progressive systems of agriculture, advanced technology, and scientific organization of the entire production process.

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* V. I. Lenin, Complete Collected Works, Vol 1, p 78

** V. I. Lenin, Complete Collected Works, Vol 5, p 101

The rate and social-economic results of scientific-technical progress in agriculture are determined to an important degree by the strengthening of its material-technical base. In the 10th Five-Year Plan, 171.7 billion rubles, or about one-fourth of the overall volume of capital investments in the national economy, was alloted for its development. Moreover, increasing means are being accorded to areas of industry which provide farm communities with equipment, fertilizer, and other means of production, as well as building materials. This facilitates an important increase in labor's access to capital and energy supplies, which relate to basic qualitative indicators of expansion of the technical framework of production, and which constitute important criteria for the acceleration of scientific-technical progress.

For the period 1965 to 1978, capital allotments for agricultural workers increased 3.2-fold, while their size per 100 hectares of arable land increased 3-fold. For these years the total power capacity per individual worker rose from 7.7 to 21.3 horsepower; per 100 hectare of area under crop--from 100 to 236 horsepower. This has exerted a telling effect on the economics of labor expenditure, which is the most important item of economic production efficiency. For the period discussed, productivity of agricultural labor increased by a factor of 1.6, and in comparison with 1940--a factor of 4.2.

Experience shows that the maximal economic effect is achieved with manifold use of the elements of scientific-technical progress, along with the complex development of the material-technical base, its rational structure, and the introduction into machine system production of progressive, group-line technology in the most important production processes. Machine systems employed by many farms in the cultivation of sugar beets, corn, and other agricultural crops, permit the elevation of labor productivity five-sixfold or more, and a 1.5 twofold decrease in product cost. Thus, the machine system developed in Amurskaya Oblast' for complex mechanization of crop production makes it possible to obtain yearly additional net profit totaling 30 million rubles, and for the Far East zone as a whole--about 50 million rubles. This system, based on optimal equipment supply calculated per 100 hectare of plowed land, and including a compliment of powered operational machinery, requires appropriate restructuring in the technology and organization of production, and revision of its dimensions. It was expected and has been confirmed in practice that the complex mechanized unit consisting of six tractor drivers and four replacements is optimal for the zone. Each such unit, employing one each K-700 and T-130 tractors, and two each T-150 and MTZ-82 tractors, with the appropriate compliment of agricultural machinery, works 980 hectares of land.

Diverse agrotechnical methods--and sometimes even different technologies--are employed in agriculture, even for cultivation of the same crops. This peculiarity presents science and practices with the task of developing machine systems, and ot perfecting technology and organization of production for existing natural economic conditions. Thus, the cultivation of wheat by irrigation, as well as by non-irrigatory methods, evidences distinctive features in its technology; one may note precisely the same point in the cultivation of this crop with respect to diverse soil-climatic zones.

Therefore, with the development and implementation of specific trends of scientific-technical progress in agriculture, it is essential to examine the particular characteristics of this field and the nature of discrete technological processes, especially with regard to sowing and harvesting of crops.

The industrial production-line technology developed by Ipatovskiy farmers of Stavropol'skiy Kray has been given wide distribution in the country. The increased technical level of production has allowed the creation of machine complexes for effectively carrying out harvesting-transport work, which in turn provides great economy of resources and labor time, and which reduces harvesting losses to a minimum. In Stavropol' these complexes are made up of mechanized units to prepare the field for harvest, three to four harvest-transport teams, and transport brigades equipped with large-capacity trucks and tractor-trailers. The daily output of grain per combine under the new technology increased by 79 percent in the kray for 1974-1978; the additive economic effect is calculated in the millions of rubles. In 1978, in just the harvest of silage alone with the use of industrial-line technology, this effective increase consisted of 5.5 million rubles.

It should, however, be noted that the widespread use of machine systems, progressive technological methods, and multifold systems embracing such highly important trends of scientific-technical progress as mechanization, chemical and biological applications, is restrained by the lagging of agriculture's material-technical base behind the requirements of complex industrialization. As was noted at the July (1978) Plenum of the CPSU Central Committee, in the allocation of labor funds and power, agriculture still lags behind industry. In 1978, 1.5 times fewer basic production funds were required per individual worker than in industry, whereas for conditions of industrialized technology, the ratio was necessarily reversed. At the Plenum, emphasis was placed on the importance of the establishment of a line of principle on increasing investments in agriculture and industrial areas of the APK [agroindustrial complex] for the successful fulfillment of tasks related to production increases. The Plenum outlined specific measures for further strengthening and development of agriculture's material-technical base. For 1981-1985, plans called for providing the farm sector with 1.87 million tractors, 600,000 grain-harvesting combines, 1.45 million trucks, and significant amounts of agricultural hardware. Special attention at the Plenum was directed to the quality of equipment and other material resources used in agriculture, and to the necessity of altering the structure of the heavy machinery-tractor fleet.

In the further development and improvement of the structure of the material-technical base of agriculture, of great importance is the establishment of proper proportions between power and operational machinery, mechanized transport, and on-loading/off-loading equipment. The maintenance base, system of technical service, and proper number of qualified maintenance engineering cadres must correspond to the existing machinery-tractor fleet. Calculations indicate that the optimal ratio between power and operational machinery, depending on the specialization, is of the order, 1:2.3-3.0. In particular, for the K-700 tractor, it is necessary to have an attachment train of 55 towed machines and implements, though until recently industry was producing only 34. In the nation's kolkhozes at the beginning of 1978, the ratio between power and operational machinery was 1:1.47, and on sovkhozes the ratio was 1:1.52. In this regard, significant differences are observed among kolkhozes of the union republics. Thus, on kolkhozes of the RSFSR the present ratio is of the order 1:1.57, Uzbek SSR--1:0.03, Estonian SSR--1:2.40.

Thus, an increase in the tractor fleet to optimal requirement per hectare (for conditions of complex industrialization at a factor of 1.5-2.0) must be accompanied by a surpassing increase in the numbers of attached machines and implements. Providing the farm sector with machinery for the creation of complex systems in all branches of agriculture is one of the important prerequisites of the better use of equipment and all other resources on which the acceleration of scientific-technical progress depends.

The effectiveness of agricultural production is to a significant extent determined by the degree of chemical application to it, which comprises one of the basic directions of scientific-technical progress. Data from many years of field experience, generalized by the USSR Ministry of Agriculture and VASKHNIL, has demonstrated that the application of one quintal of balanced mineral fertilizer allows average nationwide supplemental yields of 1.1-1.3 quintals of grain, 7.2-7.5 quintals of potatoes, 7.9-12 quintals of vegetables and melons, 6.5-7.0 quintals of fruits and berries. The profitability of mineral fertilizers employed reaches 150 percent and higher. The quantity of supplemental farm products and the efficiency of their production are increasing, provided mineral fertilizers are applied in optimal proportions with regard to plant nutrient requirements and the agrochemical content of the soil, in particular, its acidity. The means for lowering soil acidity is liming, after which they very same application level of fertilizer yields a much greater weight of supplemental harvest. In 1978, the nitrogen, phosphorus, potash ratio of fertilizers supplied to agriculture was 1:0.70:0.71, while according to recommendations of scientific institutions, it should be 1:1.1:0.8. On the whole, supplies of mineral fertilizers are still not satisfactorily meeting the country's agricultural needs, which does not permit the full use of the tremendous resource of production efficiency increases and product quality improvement. Along with an increase in fertilizer supplies, which were projected for 1985 to reach 135-140 million tons, there is real need for the efficient use, and a reduction of losses in the process of transporting, storing, and applying them.

The All-Union Production-Scientific Association for Agrochemical Service to Agriculture, "Soyuzsel'khozkhimiya," was organized with the aims of assuring the sound use of mineral and organic fertilizers, chemical and biological means of plant protection, soil improvement agents, feed supplements, growth stimulants, and other chemical applications to agriculture on kolkhozes, sovkhozes, and other state agricultural enterprises.

The most important condition for the effective operation of this association is the strengthening of the material-technical base of chemical applications, the provision of suitable maintenance through special technology, and the modernization of fertilizer storage systems and load-handling equipment, etc. Currently, while the storage level of mineral fertilizers in kolkhoz and sovkhoz warehouses is assured at 54 percent, a paucity of specialized technology for the use of fertilizers and other chemical agents is apparent, which leads to losses of these resources, a lowering of their quality and a shortfall in agricultural production.

The particular nature of scientific-technical progress under conditions of agricultural development is its tending toward conclusive national-economic results, which assumes the complex proportional development of all spheres of agroindustrial complex. It is important not only to obtain more high-quality, low-cost products in agricultural production, but also to get them to the consumer without losses. Right now, with the growth of production volumes, the problem of accelerated neotechnological development of the agricultural infrastructure--road-transport and warehouse systems redevelopment, strengthening of the material-technical resource base in the area of product processing, storage, sale, etc--is becoming urgent.

One of the basic trends of scientific-technical progress in agriculture is the creation of new varieties of agricultural crops through selective breeding. Soviet breeders were among the first in the world to successfully employ interspecific and extraspecific hybridization for the creation of new varieties, while achieving outstanding results. Bearing witness to this is the introduction of highly productive varieties of grain, oleiferous, industrial, and feed crops. An added effect of the development of new plant varieties is obtained both in the form of harvest supplements and improvement in the quality of farm products. Thus, on average from 1971-1976, the profitability of grain production was measured at about 60 percent, while the profitability of high-quality varieties exceeded 200 percent. An increase in the protein content of the wheat kernel by 1 percent will permit a supplemental yield, with the same production volume, of 450,000 tons of protein per year. The use of standardized seed varieties allows yearly supplemental yields of up to 30 million tons of grain. The expansion of crop land under strong-stemmed varieties of grains in very damp zones prevents significant production losses during harvesting. The introduction of sunflower varieties with high oil-content has made possible a general yearly supplemental yield for the country of about one million tons of oil totalling upwards of 1.5 billion rubles in value. Improved long fiber varieties of cotton promote growth of profitability in the industry by a factory of 1.5 and more. The increase in starch content of potatoes owing to the introduction of new varieties is also an important resource of agricultural efficiency in an area where, in recent years, a decline in the quality of produce was observed (the starch content of potato tubers declined by one percent). Investments in the improvement of livestock strains have a strong effect.

With acceleration of scientific-technical progress, characteristic changes occur in the primary production force--people. The nature and content of labor in general production work is altered, and requirements for quality of labor resources significantly increase. The task of raising the general educational level of workers becomes more and more urgent, so too their qualifications and periodic retraining. The complication of applied technology comprising the material base for the acceleration of scientific-technical progress leads to an increase of creative elements in the labor process, but the very process of production is transmuted ?...from a simple labor process to a scientific process."* In step with the technical equipping of agriculture grows the professional-qualifications level of its workers and the relative importance of its machine operators. In 1978, their number surpassed 4.4 million men, against 3.0 million in 1965. The overall number of workers in general production in the nation's kolkhozes for this period decreased by 22.6 percent, while the number of tractor drivers and machine operators increased by 13 percent. Their relative significance in the overall quantity of kolkhoz personnel engaged in general production increased correspondingly from 7.4 to 10.9 percent.

Kolkhoz and sovkhoz specialists have improved provisioning capacity. Forty specialists with higher and secondary specialized training are required for each sovkhoz in the country, and 42 speicalists for each kolkhoz. However, workers not having special higher or secondary agricultural training make up 40.8 percent of the country's kolkhoz production brigade workers in crop production, and 41.5 percent of managers and workers on livestock production farms. As before, one observes a shortage of machine operators, as well as the instability of their numbers. This is caused by unsatisfactory labor conditions related to unimproved equipment and technology, and inadequate levels of cultural-lifestyle development in the farm sphere. The qualitative redevelopment of this sphere, the importance of which are underscored at the July (1978) Plenum of the CPSU Central Committee, is one of the basic preconditions for the acceleration of scientific-technical progress in agriculture.

The continuation of economic productivity of the land and its efficient use is an important trend of scientific-technical progress in agriculture. Special roles in this are assigned to specialization, the sound disposition of production, optimal soil structure, the heightening of general agricultural levels of social welfare, and especially the use of crop rotation. The solution of these problems depends greatly on forms and methods of production planning and preparation of purchase plans. It is essential to employ more actively key factors and stimuli to self-sufficiency in the operation of official procurement systems and other organizations and departments concerned with land use and natural resources in agriculture. At the same time, there is need to implement a complex of measures for

* K. Marx and F. Engels, Works, Vol 46, ch 2, p 208

the preservation of land resources, which should include the efficient organization of land territories, the preservation and elevation of soil fertility, land recultivation, and the improvement and maintenance of landforms.

Liming, as one of the most cost-effective courses of intensive development, assures the effective use of scientific and technological advances in agricultural production, and establishes preconditions for obtaining guaranteed harvests independent of weather conditions, thereby raising land productivity. For example, in 1978, irrigated land, comprising 7.5 percent of plowed land and 3 percent of general agricultural land, yielded 24 percent of the production of agriculture. Analysis of many years of data testifies to the fact that capital investments in irrigation in established systems with well-developed land, yields a supplemental net profit, but the time periods of repayment are significant: in rice culture, 5 to 7 years, and in grain feed systems, 8 to 10 years. Limited use of scientific-technical progress trends sometimes prevents the realization of anticipated productivity on irrigated lands.

The effectiveness of the use of irrigation systems depends greatly on their proper operation. Strengthening of the material-technical base of organizations operating irrigation systems, and improving their structure allows the conversion to specialized technical service in maintenance and repair of inter-economic land-reclamation networks from the aspect of drawing up planning-estimate documentation on repair work, and also allows the timely and effective performance of this work, including repair of hydrotechnical equipment and pumping stations. The raising of the use effectiveness of irrigated land is tied to the establishment of self-support contractual relationships between irrigation system administrations and farms which they serve, as well as to the introduction of progressive forms of labor organization, production, and industrial technology in irrigation agriculture.

The particular nature of farm production in irrigation agriculture consists in the fact that water emerges here as a critical factor and at the same time as a deficit resource. The effectiveness of irrigation to a large extent depends on the introduction of scientific and technical advances which assure the efficient use of water. Scientific research conducted by "Moldgiprovokkhoz" [Moldavian State Institute for Agricultural Production], has shown that equipment for the drip method of irrigation requires half as much capital investment as equipment for flood irrigation, and provides great savings of metal, pipes, and routine expenditures. Water usage is reduced, indeed, field work can be carried on without interrupting irrigation and at virtually any time. Moreover, the effectiveness of fertilizer application is increased since, along with the water, it is provided directly to plant roots over the course of the entire period of their growth.

The improvement of irrigation systems by eliminating or reducing losses from filtration and evaporation is an important reserve in the efficient use of water. In closed irrigation systems, the k.p.d. [coefficient of useful work] is on the order of 0.8-0.9, while in open systems it is 0.5-0.7. For the efficient use of water it is essential that the following be implemented: the conversion of a number of industrial and other production facilities to a water-less technology; the lowering of water allocations in several areas of agriculture and industry and the more widespread conversion of facilities to a recycling water supply; the introduction of effective methods of waste and sewage water purification; the reduction of losses of water in all sphere of its use.

In situations involving the multifold use of advancements in scientific-technical progress in agriculture, its economic effectiveness will be in large part determined by the kinds of technological and production-economic modes in which clean water is involved in the production process, as well as in irrigation. The inefficient use of water and the pollution of water reservoirs both lead to an increase in the deficit of this limited resource. Particularly in regions having limited water provisions, the use of waste water from rice culture irrigation has great importance. Thus, in Krasnodarskiy Kray, in 1977, 520 million cubic meters of water was recycled for irrigation, 29,300 hectares of crop land was irrigated, and, by 1985, recycled water will irrigate 60,000 hectares.

In the problem of efficient use and effective redevelopment of natural resources, planning for natural resource preservation must occupy an important position. Presently, there are no provisions for environmental preservation and efficient use of natural resources in industrial and agricultural plans. Planning indices for protection of the environment (excepting the amount of state capital investments and effectuation of rates and objectives of natural resource preservation intent), which are instituted in plants, construction projects, kolkhozes, and sovkhozes have almost no centralized correlation with production and other indices, and are not linked with the material, labor, and financial resources of commercial enterprises. Within the aims of complex planning for environmental protection measures and coordination of work in this direction, it is essential to improve regional planning within the borders of economic regions and their territorial subdivisions, and to plan environmental preservation measures and rational use of natural resources for commercial enterprises.

The acceleration of scientific-technical progress and an increase in the efficiency of natural resource utilization assume the elaboration of cadastral land surveying and the establishment of economic value of land resources. The quality of natural resources effects labor productivity and acts as a basis for the development of supplemental net profit, including differential profit. Qualitative accounting and economic valuation of land is the objective basis of the disposition of production and the intensification of specialization. The opportunity arises within this basis for more aggressively developing departmental and zonal machine systems, and progressive technologies. Economic valuations of land, as shown by the experience of its implementation in Lithuania and Stavropol'skiy Kray, allows, with consideration to specific conditions, a more differential approach to purchase planning, economic stimulation, and objective appraisal of labor results. Therefore, in terms of non-subsidized industrial operation, natural resource valuation is an objective necessity.

Scientific-technical progress objectively requires improvement of the organization of agricultural production, its more intensive specialization, and unification of farm efforts with the aim of efficient use of the sector's productive force. The development of the processes of interfarm cooperation and agroindustrial integration has a special importance in the acceleration of scientific-technical progress and the increase in production efficiency in this regard.

In 1978, there were in the country more than 8,900 interfarm enterprises, organizations, and associations, basic funds of which totalled 7.9 billion rubles. The high level of technical supply and the applicat on of new forms of organization and administration in interfarm enterprises and associations has permitted production gains, calculated per man/day of gross production, 2.1 times, and profit returns per each ruble of production expenditure, three times greater than on farms which accomplish production without regard to interfarm cooperation. The experience of the work of many interfarm enterprises testifies to the high effectiveness of their production. Thus, in 1978 on the Ust'-Labinskiy interfarm enterprises, "Progress," which specializes in cattle fattening, 9,700 head of cattle--83 percent of them at higher fattness levels--were raised and sold to the state. Average weight of the marketed livestock was equal to 428 kg, while the average daily weight gain was 776g. On a related note, 8.3 quintal of feed units were expended per centner of weight gain, 3.2 man/hours per quintal, and cost amounted to 92.8 rubles (compared against 392 man/hours and 197.6 rubles, respectively, on the nation's sovkhozes), profitability comprised 50.5 percent (compared with 9 percent for sovkhozes in general). The interfarm enterprise yielded around three million rubles in profits. The Timashevskoye interfarm association in Krasnodarskiy Kray, which raises and fattens cattle, obtained in excess of five million rubles in profits.

Interfarm agricultural cooperation is developing more and more widely in crop production--production of fruits and vegetables in both protected and open plantings, production of seed, fodder, etc; in stock-raising--rearing and fattening of cattle, hog production in terminated and dual stages, non-beef cattle raising, incubation, and production of eggs and poultry, etc. The forming of interfarm cooperatives is also being carried out in areas of production-technical service (in land-reclamation and agrochemical service, in technology and power system maintenance, in construction work, etc).

With the acceleration of scientific-technical progress, one observes the development of new forms of direct consolidation of science with production, which is being achieved in a number of scientific-production associations (NPO). Presently, all-union, zonal, and regional scientific-production associations are widely active in the national agriculture. In a number of instances, large farms are developing from institutes; scientific-production associations as well are being formed on an institutional basis with an expansion of their production-experimental operation. The Estonian Institute of Livestock Production, the Uzbek Horticultural Institute, and many others are operating on the principles of scientific-production associations. One may judge the effectiness of the organizational-economic communion of science and production by the results of the operation of the scientific production associations, "Dnestr," established on the basis of the Moldavian Scientific Research Institute for Irrigation Agriculture and Vegetable Production, experiment station, experimental-seed farms, and other scientific and production components. As early as 1976, the association produced and sold 27,000 centners of high-quality vegetable seed, or 1.7 times more than in 1973, when seed was supplied by the 43 farms originally engaged in this area of seed production. The yearly supplemental income for the use of scientific-production association seed consists of about 50 million rubles.

The economic effectiveness of fundamental aspects of scientific-technical progress will be higher with the successful elimination of the uncoordinated, bureaucratic approach to implementation of planning-economic measures in production control. This presumes the formation, based on individual organs, of a planning control for the national-economic agroindustrial complex. The conditions for a purposive implementation of a singular technological and economic policy, as the most important element of the manifold achievement of scientific-technical progress will be created within the strict limits of an organizationally well-designed agroindustrial complex. Coordinated with the ultimate goals of agroindustrial complex, the development of the agricultural infrastructure, sectors of technical service, material-technical supply, as well as the consistent improvement of planning and value-setting, and the establishment of correct proportions between values in all types of agroindustrial complex production, will facilitate the achievement of the necessary redevelopment balance within the complex. For its part, it is the essential economic prerequisite for the use of an effective system for stimulating scientific-technical progress and raising economic effectiveness in all structural components of the agroindustrial complex.

The broadening of international cooperation is, on the whole, acquiring ever-increasing importance for the acceleration of scientific-technical progress in agriculture and the agroindustrial sector of economics. A major role in this is attributed to the cooperation of member nations of CEMA within the limits of international specialization and cooperation in the reciprocal exchange of information on scientific and technical breakthroughs in the agricultural sector. In conformity with the accepted agreements, there are currently being made reciprocal deliveries of selected seeds and planting material of 41 basic agricultural crops, 12 of the most important veterinary preparations, distinct types of pedigreed cattle, and equipment for the repair and technical maintenance of 137 denominations of agricultural machinery. Adopted in 1978, the international system of machinery for agriculture already encompasses more than 700 types and 1,750 type-classifications of machinery, the reciprocal deliveries of which are constantly being expanded. The USSR sends tractors to other CEMA countries, grain-harvesting combines and so forth, while it receives equipment for dairy complexes and cattle milking devices from the GDR, and equipment for the preparation of grass meal from Poland.

The exchange of acquisitions of scientific-technical progress has a great economic effect. Thus, improvement of the system of technical maintenance of the machinery-tractor fleet on the basis of reciprocal exchange in this sector, allows, for example, a five to ten percent increase in the extent of the fleet's use, an 8 to 12 percent decline in the expenditure of spare parts, and a 50 to 60 percent reduction of down-t8me for technical reasons.

Recently, in the Hungarian People's Republic, owing to the wide use of varieties of sunflowers of soviet breeding, which were planted over more than four fifths of the area sown to this crop, they are obtaining a supplemental yield of one centner of vegetable oil from each hectare with virtually the same cost outlay. For their part, other CEMA countries, particularly the USSR, have an interest in the employment of Hungary's achievements in the creation of industrial production systems (IPS) based on advanced complex industrial technology which permits, for example, yields in excess of 80 centners of corn from one hectare, and the obtaining of maximal weight gains for cattle and poultry, with a significant reduction of cost per unit of production. The delivery to the USSR from Hungary, in accordance with a contract signed in 1978, of two broiler factories (yearly productivity of each is 10.6 million broilers) and two poultry breeding systems will have major significance for further increases in poultry production efficiency.

The application of world-wide experience has a definite significance for the acceleration of scientific-technical progress. V. I. Lenin wrote that from universal, including capitalist, practice, "...it is necessary to take all of the science, technology, all of the knowledge.... Without this, we cannot build the life of communist society...."* The use of machine systems and industrial complexes, as well as separate types of field and farm machinery and equipment purchases in the U.S., Italy, and other foreign countries gives substantial results in the application and improvement of industrial technology. Achievement of the so-called, "green revolution," have great importance for the improvement of breeding work.

The acceleration of scientific-technical progress in agriculture presumes a complex approach to more intensive use of all factors of expanded production, and to the assured conversion of productive agricultural forces to an essentially new makeup. Organizational-economic, material-technical, and social factors of growth in the level and economic effectiveness of agricultural production thus have major significance with respect to the broad use of all contemporary achievements of science and technology.

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* V. I. Lenin, Complete Collected Works, Vol 38, p 55

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CLASSIFICATION OF AGRICULTURAL RECLAMATION

Moscow IZVESTIYA VSESOYUZNOGO GEOGRAFICHESKOGO OBSHCHESTVA in Russian
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[Article by K. V. Pashkang, V. A. Shkalikov: "The Classification of Agricultural Reclamation"]

[Text] At the present time a new branch is developing within the system of geographic sciences, that of reclamation geography (1, 10). Moreover, a topographical approach is becoming more and more important for studying lands with the purpose of reclaiming them. Topographists are examining their participation in this type of work as the solution to one of the directions taken by applied topographical science (6).

In topographical geography, which is in a developmental stage, there are many unsolved problems that remain to be discussed. One of them is common to all sciences that are involved in improving lands and is the problem of classifying reclamation.

The existing situation can be explained first by the fact that the term "reclamation" means different things to different specialists. Today the term "reclamation" most commonly means the persistent alteration of the properties of natural complexes within a particular territory by means of their systematic management in the interests of various branches of the national economy. It should be emphasized that there can be various approaches toward the classification of reclamation. For example, it is possible to create a single classification scheme for all types of reclamation, i.e. "general" reclamation, regardless of what branch of the economy realized it. It is possible to develop several classifications in accordance with the purpose of the reclamation--for agriculture, building, etc.

There is unquestioned interest in the general classification of reclamation proposed by V. T. Grinevetskiy and structured on a geographic base (5).

While not denying the rightfulness of the existence of such a single classification of reclamation we should recognize the necessity (primarily for practical purposes) of "particular" classifications for special purposes as well. Depending upon the branch of the economy in which reclamation is utilized it can be subdivided into agricultural, construction, forest, recreational and others. At the present time reclamation is most widely utilized in agriculture, where a large amount of experience regarding its use has accumulated. For this reason we must first solve the problem of the classification of agricultural reclamation.

Using the existing experience in classifying reclamation (2, 3, 4, 7, 8, 9) as a basis and using the requirements for geographical classification as a guide, we have made the attempt to develop a general classification scheme for agricultural reclamation. The proposed scheme (see Table) singles out subordinate units from the systems of reclamation enterprises as well as the methods and means of reclamation.

The highest classification unit of the given scheme is the class of reclamation. Each class represents a system of reclamation measures that act on a particular component of the geographical complex, which when altered results in an improvement of some of its properties. There are three classes of reclamation--water, land and climate. All water recalmation is directed primarily at regulating the water regiment and the water resources of a territory; land--at changing the soil surface and the characteristics of the soil layer; and climactic--at improving weather conditions.

The type of reclamation is the portion of reclamation measures within a class which is singled out depending on its action on particular properties and processes of the natural complex. In addition, it reflects the general approach toward the regulation of individual processes and properties. Thus, for example, hydrotechnical reclamation is realized with the aid of the building of various structures (canals, locks, drainage, pumping stations, etc.); agrotechnical--with the use of individual methods of soil cultivation; and wood-technical--with the aid of the planting of woody vegetation.

Reclamation methods belonging to the same type are frequently utilized to regulate various components of nature. For this reason such types of reclamation as hydrotechnical, wood-technical, agrotechnical are singled out by us within various classes.

Water reclamation is subdivided into three types: hydrotechnical, wood technology and agrotechnical. The first is directed primarily at regulating surface and ground waters, the second--at surface waters and soil moisture, and the third--at soil moisture and the snow cover. Within land reclamation there are seven types--cultivational, chemical, structural, thermal, hydrotechnical, wood-technical and agrotechnical. Cultivational reclamation is related to improving the surface of the soil, chemical--to improving its agrochemical properties, structural--its physical properties, and thermal--to improving the soil climate. The remaining types of land reclamation are directed at combatting soil erosion, at strenghthening sands (wood-technical, agrotechnical) and at increasing the nutrients in the soil (agrotechnical).

Scheme of the Classification of Agricultural Reclamation

Basic Classification Units			Methods and Means of Reclamation	
Class	Type	Kind	Method (examples)	Means (examples)
Water	Hydraulic engineering	Drainage	Accelerating the water current from the soil surface; lowering the level of ground waters; decreasing the inflow of water in drained territory	Open network of canals, closed drainage; drainage with mechanical water-lifting
		Irrigation	Surface watering; sprinkler irrigation; subsoil irrigation	Irrigation by strips; irrigation by furrows; water-retaining irrigation; irrigation using sprinklers; pressure subsoil irrigation
		Flooding the territory	Utilization of ground waters; redistribution of surface waters	Drilling of artesian wells; building of irrigation channels, ponds and reservoirs
	Wood-technical	Accumulation of moisture in soil	Decelerating thawing of snow; decreasing surface current; accelerating penetration of moisture in soil	Forest plantings along rivers and reservoirs; massive and various-sized forest plantings near water divides
	Agro-technical	Drainage	Accelerating the water current from the soil surface; accelerating intra-soil current; accelerating of snow thawing	Narrow-pasture plowing; selective ridging, furrowing; surface analysis; mole drainage; blackening of snow surface; hoeing compact snow
		Accumulation of moisture	Increasing the absorption capacity of soil; snow-accumulation; snow-retention	Deepening the plowing layer; deep tillage; mole drainage; furrowing of snow; compacting snow; sowing tall-stemmed plants, forest vegetation; creating artificial, temporary barriers

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Scheme of the Classification of Agricultural Reclamation

Basic Classification Units			Methods and Means of Reclamation	
Class	Type	Kind	Method (examples)	Means (examples)
Land	Cultiva-tional	Preparation and improvement of soil surface for agricultural use	Elimination of mechanical hindrances to soil cultivation; elimination of wood-shrub vegetation	Elimination of hillocks; removing rocks from land being reclaimed; surface planning; cutting shrubs and small forest plantings
		Cultivating plowing layer	Primary soil cultivation; initial soil fertilization	Deepening the plowing layer; mouldboard plowing; levelling soil; application of organic fertilizers
	Chemical	Enriching soils with nutrients	Fertilization of soil	Application of organic and mineral fertilizers and micro-fertilizers
		Decreasing acidity in soil	Neutralization of acidity	Liming; chalking; application of dolomite meal, marl
		Combatting weeds, pests, diseases of agricultural plants	Decreasing photosynthesis in plants; destruction of plant fiber; affecting the enzymes that regulate cell activity	Use of herbicides, pesticides
		Desalinization of soil	Neutralization of salts; surface washing of salts; thorough irrigation of salts	Gypsuming; acidification; liming; flooding plots; irrigation with deep drainage; irrigation with shallow drainage
	Structural	Creation of plowing layer	Fill method of cultivation; Wash-in of soil	Earth moving of solonets;kal'matsiya [Translation unknown] of sands and pebble-beds
		Improving structure, physical properties of soil	Mixed cultivation method; artificial structure-formation	Claying, sanding of peat bogs; claying of sands; sanding of clays; use of polymers

Continuation

Basic classification units			Methods and means of reclamation	
Class	Type	Kind	Methods (examples)	Means (examples)
Land	Heat	Increasing inflow of heat into soil	Regulating the components of radiation balance; altering soil surface	Mulching soils; ridging; bedding; terracing slopes
		Protecting ground from environment	Change in components of radiation, heat balance	Building of hothouses and greenhouses; covering plants with panels
	Hydraulic engineering	Protecting soil from water erosion	Decelerating current of surface waters; avoiding overflooding of canals	Creating channel-type spillways, water drops, water-deflecting embankments and canals; perpendicular bottom dams; shutting scarps of channels; strengthening slopes of channels with porous concrete
	Wood-technical	Protecting soil from erosion	Decreasing surface current	Forest plantings near swamps, ravines; forest plantings in swamps, ravines; belt, various-sized and massive forest plantings on mount mountain slopes
		Fastening sands	Fastening sands using roots of plants; decreasing wind speed	Planting willows; various-sized and massive forestation on loose sands
	Agro-technical	Protecting soil from erosion	Decelerating current of surface waters; acceleration of absorption of moisture into soil	Plowing across slope; fall-winter plowing of fields; deep tillage; non-mouldboard plowing; sowing perennial grasses
		Fastening sands	Fastening sands using roots of plants	Sowing of sand-loving grasses
		Enriching soil with nutritive matter	Biological fixation of atmospheric nitrogen	Green manuring of soil; sowing of leguminous grasses

Continuation

Basic Classification Units			Methods and Means of Reclamation	
Class	Type	Kind	Methods (examples)	Means (examples)
Climactic	Acting on meteor-ological processes in the free atmosphere	Artificial inducation of precipitation	Stimulation of the development of clouds	Scattering a fine powder in the air
		Avoiding hail	Artificial enlargement of ice crystals in clouds	Dispersal of reagents
	Acting on meteor-ological processes in air mass near earth	Combatting frost	Increasing the temperature of the air layer near earth	Smudging of fields; artificial fog screen; sprinkler irrigation of soil
	Wood-technical	Combatting dust storms and dry wind storms	Decreasing wind speed; increasing air moisture	Wind-breaking forestation on arable land

Climactic reclamation is subdivided into three types. The first type includes reclamation that is directed at changing individual meteorological processes in the free atmosphere; the second type includes measures that regulate meteorological processes in the air strata near the earth; and the third--forest engineering measures directed at combatting dust storms and dry wind storms.

The types of reclamation, as we have noted, are categorized primarily according to the prevailing action on specific processes and properties of the natural complex. But since all the natural components are closely linked amongst themselves, reclamation directed at regulating particular natural properties can sometimes have a lesser effect on other properties. Thus, structural reclamation on peat soils improves not only their physical properties but also the temperature regiment to a significant degree. For this reason this type of reclamation is employed usually in drained swamps to improve the temperature regiment.

The next classification unit is the kind of reclamation and is represented by a group of reclamation measures within a type. They are singled out according to what the aim and direction of changes in natural properties and processes are. The scheme presents the basic kinds of reclamation. It is not difficult to note that many of them are similar to each other but differ in reclamation method. For example, measures to combat water erosion of soils, included in hydrochemical reclamation, are realized through methods such as the creation of channel-type spillways, falls in water level, and water-retaining embankments. Soil-conservation measures, however, included in forest engineering reclamation, consist of forest plantings near ravines and swamps and belt or different-sized forest plantings on the slopes of mountains.

The methods and means of reclamation are also included in the classification. The methods used depend upon the way in which the regulation of individual natural properties and processes are realized; the means are procedures which aid in solving the task of regulating these properties and processes. The same reclamation methods can belong to various types and even classes. Thus, the application of organic matter is utilized in performing cultivational operations as well as in chemical reclamation. Some types of plowing (non-mouldboard, mouldboard) are utilized within agrotechnical and cultivational reclamation.

The proposed classification of agricultural reclamation is preliminary in nature and in the future it can be supplemented or made more precise.

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CLASSIFICATION OF SOIL

Moscow MEZHDUNARODNYY SEL'SKOKHOZYAYSTVENNYY ZHURNAL in Russian No 6, 1979 pp 29-34

[Article by Professor V. Fridland; N. Sorokina, candidate of agricultural sciences; G. Shershukova, Soil Institute imeni V. V. Dokuchayev, USSR: "Coordinating National Soil Classifications Among European Countries-Members of CEMA [Council of Mutual Economic Aid]"]

[Text] The member countries of CEMA, within the framework of scientific-technical cooperation, are jointly dealing with a broad spectrum of questions related to raising the fertility of the soil. The exchange of experience on this problem must take the natural conditions of the countries into account in order to have a basis for the utilization of scientific and production results in similar territories. The same can be said of the new crop varieties, especially of those that have been developed recently. It is very important to have an exchange of methods of research and of rapidly determining soil properties and the content of nutrients in the soil. This is essential for preparing specific recommendations on introducing fertilizer, on cultivating soil and on performing other agrotechnical operations.

The successful exchange of the results of scientific research and leading experience between the member CEMA countries is complicated by the different soil classification. At the present time each European CEMA member has its own national classification system which utilizes a historically-developed terminology to describe many soils. In addition to this there are common terms, but sometimes they mean different things in different countries.

In September 1976 the first coordinated scientific meeting within the framework of CEMA took place in Sofia. Its theme was "The Study of the Laws of Soil Formation, its Properties which Affect the Yield of Agricultural Crops and the Improvement of Production Classifications and Methods of Soil Cartography with a Consideration of the Remote-Control Method."This heralded the start of work on comparing soil classifications of the CEMA countries. All scientific institutions have joined in this work to coordinate their research on this topic.

From Bulgaria the work was done by the Institute of Soil Science and Programmed Harvests imeni N. Pushkarov (Doctor M. Yolevski and others), from Hungary--the Institute of Soil Science and Agrochemistry of the Academy of Sciences of the Hungarian National Republic (Doctor G. Varallyay and others), from the GDR--the Sector on Soil Science (Eberswalde) of the Center on Soil Fertility in Muncheberg (Professor I. Lieberoth, Doctor V. Koepke and others), from Poland--the Institute of Agrophysics and Soil Reclamation in Lyublin and the Institute of Agrotechnology, Fertilizers and Soil Science of the city of Pulavi (Professor J. Glinski, Professor N. Florea and others), from the Soviet Union--the Soil Institute imeni V. V. Dokuchayev, from Czechoslovakia--the Institute of Soil Science and Plant Nutrition in Bratislava (Professor J. Hrasko and others) and the Institute of Soil Science and Plant Nutrition in Prag (Professor J. Nemecek and others). The coordinator of the joint work is the Soil Institute imeni V. V. Dokuchayev (USSR).

First the collaborating institutes exchanged existing soil classifications with the diagnostics of classification detail. On the basis of these materials the classification units of soils from the different countries were juxtaposed.

The authors of the article composed a composite table of soil classifications for the European CEMA members. The final version was confirmed by the participating countries of the Second Scientific-Coordinated Meeting in September 1978 in the city of Bratislava (Czechoslovakian SSR).

In addition to the classification of soils of the European CEMA member countries the table also includes the soil classification developed by the FAO [UN Food and Agricultural Association] and UNESCO for the World Soil Map at a scale of 1:5000000 and published by these organizations in 1974-1978. This enables soil scientists to compare their material with that of other countries scientifically.

The present table compares the designations of soil types and of some specific sub-types. The inclusion of lower taxonomic units (subtypes, types and kinds of soils) would have resulted in extreme complexity.

The composition of the table was somewhat difficult. First of all it was necessary to consider the content of diagnostic soil characteristics of the different CEMA countries as well as the different soil-analysis methods. Moreover, the term "soil type" differs in different countries with regard to some groups of soils. Thus, the "chernozem" type in the classification of the USSR corresponds to several soil types in the classifications of Hungary, Rumania and Czechoslovakia and the "podzol soils" type in the soil classification of the USSR corresponds to several soil types of Poland, the GDR, Rumania and Czechoslovakia.

The same picture emerged with regard to other soils. For example, the illimerizovana gleyed soils of Czechoslovakia correspond to several types of soils in the USSR classification. One soil type in the classification

A Comparison of Soil Classifications of CEMA Countries (on the Level of Types and Some Important Subtypes of Soils)

СССР USSR	ПНР POLAND	ГДР GDR	ВНР HUNGARY	ЧССР Cz	НРБ NRB	СРР Romania	ФАО—ЮНЕСКО FAO—UNESCO
Подзолистые почвы (1) Подзолистые, используемые в земледелии (2)	Bielice Gleby bielicowe Gleby rdzawe	Podsol Fahlerde Rosterde (Typ Braunerde)		Podzol Illimerizovaná půda Rezivá půda		Podzol (Sol podzolic humicoferiiluvial) Sol podzolic argiloiluvial	Podzols Orthic Ferric Humic Leptic Placic Podzoluvisols Eutric Dystric Arenosols Cambic Luvic
Подзолистые культурные и другие интенсивно окультуренные почвы (3)	Hortisole (Gleby ogrodowe) Rigosole (Gleby regulówkowe)	Hortisol Rigosol		Rigolovaná půda Zahradní půda			
Болотно-подзолистые почвы (4)	Gleby opadowo-glejowe (pseudoglejowe) Gleby bielicowe Bielice	Staugley Amphigley		Pseudoglej Stagnoglej Amfiglej			Podzols Gleyic Podzoluvisols Gleyic Planosis Dystric Eutric Humic
Дерново-карбонатные почвы (5)	Rędziny Pararędziny	Rendzina	Humusz-Karbonát Rendzina talaj	Rendzina Pararendzina	Рендзини (хумусно-карбонатни)	Rendzina Pseudorendzina	Rendzinas Cambisols Calcic
Дерново-глеевые почвы (6)	Gleby gruntowoglejowe	Grundgley		Glej		Sol gleic	Gleysols
Серые лесные почвы (7)	Szare gleby leśne	Griserde (Typ Fahlerde)		Šedozem	Сиви горски	Sol cenuşiu	Greyzems Orthic
Серые лесные глееные почвы (8)	Szare gleby leśne oglejone	Grisstaugley (Typ Staugley)		Šedozem	Светлосиви горски	Sol cenuşiu gleizat Sol cenuşiu pseudogleizat	Greyzems Gleyic
Бурые лесные почвы (буроземы) (9)	Gleby brunatne	Braunerde Parabraunerde (Typ Fahlerde)	Erősen savanyú nem podzolos barna erdőtalaj Anyagbemosódásos barna erdőtalaj Barnaföld Kovárványos barna erdőtalaj Karbonát maradványos barna erdőtalaj Csernozjom barna erdőtalaj	Hnědá půda Hnědá půda kyselá Pelosol Terra calcis	Кафяви горски Тъмноцветни горски	Sol brun argilic Sol brun (eumezobazic) Sol brun acid Sol brun podzolic Terra rossa Vertisol	Cambisols Eutric Dystric Humic Calcic Arenosol Cambic
Бурые лесные глеевые почвы (10)	Gleby brunatne oglejone Gleby brunatne opadowoglejowe	Halbamphigley (Typ Amphigley) Braungley (Typ Grundgley)	Pszeudoglejes barna erdőtalaj	Hnědá půda Pseudoglej Stagnoglej		Sol pseudogleic	Cambisols Gleyic

Key follows complete list.

СССР	ПНР	ГДР	ВНР	ЧССР	НРБ	СРР	ФАО—ЮНЕСКО
Подзолисто-бурые лесные почвы (подзолисто-буроземные) (11)	Gleby płowe	Fahlerde	Podzolos barna erdőtalaj	Illimerizovaná půda Hnědozem	Светлосиви горски Канелено-подзолисти (псевдо-подзолисти)	Sol brun podzolic Sol podzolic argilo-illuvial Planosol	Luvisols Orthic
Подзолисто-бурые лесные глеевые почвы (подзолисто-буроземные глеевые) (12)	Gleby płowe (opadowo-glejowe) Gleby płowe oglejone	Staugley	Pszeudoglejes barna erdőtalaj	Illimerizovaná půda oglejená Pseudoglej Stagnoglej	Светлосиви горски (псевдо-подзолисти) Канелено-подзолисти (псевдо-подзолисти)	Planosol Sol pseudogleic	Luvisols Gleyic Albic Planosols Gleyic Eutric Dystric
Луговые подбелы (13)	Gleby opadowoglejowe (pseudoglejowe) Gleby gruntowoglejowe	Staugley Amphigley		Illimerizovaná půda oglejená Pseudoglej		Planosol Sol pseudogleic	Planosols Mollic
Черноземы (включая черноземы слитые) (14)	Czarnoziemy leśnostepowe	Schwarzerde	Erdőmaradványos csernozjom Kilúgozott csernozjom «Dunamenti» vagy «mészlepedékes» csernozjomok Terasz-csernozjom	Černozem Smonica	Черноземи Смолница	Cernoziom Cernoziom levigat (cambic) Cernoziom argilic (argiloiluvial) Vertisol (sol negru acid)	Chernozems Phaeozems Vertisols
Лугово-черноземные почвы (включая лугово-черноземные слитые) (15)	Ćzarnoziemy leśno-łąkowe Czarne ziemie	Schwarz-staugley (Typ Staug-Schwarzgley (Typ Grundgley)	Réti csernozjomok	Černice Černozem černicová (Typ Černozem)	Ливадни черноземи Ливадни черноземи-смолници	Sol humicogleic Lăcoviste	Gleysols Eutric Calcaric Mollic Phaeozems Gleyic
Каштановые почвы (16)						Sol bălan	Kastanozems
Лугово-каштановые почвы (17)						Sol bălan	Gleysols Calcaric
Луговые почвы (18)	Czarne ziemie Gleby glejowe	Humusgley Humus-staugley	Réti talaj Szolonyeces réti talaj Szoloncsákos rétitalaj Csernozjom réti talaj	Černice	Блатни	Lăcoviste	Gleysols
Коричневые почвы (19)			Csernozjom barna erdőtalaj		Канелени горски	Sol brun roscat Solbrun roscat podzolic Terra rossa	Luvisols Chromic Vertic Cambisols Chromic
Лугово-коричневые почвы (20)					Ливадни-канелени		Luvisols Gleyic Cambisols Gleyic
Подзолисто-желтоземные почвы (21)					Жълтоземно-подзолисти		Acrisols

СССР	ПНР	ГДР	ВНР	ЧССР	НРБ	СРР	ФАО—ЮНЕСКО
Торфяные болотные верховые почвы (22)	Gleby torfowe torfowisk wysokich i przejściowych	Ubergangsmoor Hochmoor	Fellápok (mohaláp)	Semifibrózní rašelinná půda Fibrózní rašelinná půda	Торфеноблатни	Sol turbos	Histosols Dystric
Торфяные болотные низинные почвы (23)	Gleby torfowe torfowisk niskich	Ried (Niedermoor)	Sikláptalajok (nádas, sásos, gyékenyes)	Rašelinná glejová půda Humózní rašelinná půda	Торфеноблатни	Sol turbos	Histosols Dysric
Торфяные верховые освоенные почвы (24)	Gleby murszowe					Sol turbos	Histosols Dystric
Торфяные низинные освоенные почвы (25)	Gleby murszowe	Fen (Niedermoor)	Lecsapolt és telkesített sikláptalajok			Sol turbos	Histosols Eutric
Лугово-болотные почвы (26)	Gleby mułowe	Anmoorgley Humusgley	Lápos réti talaj	Černice Glej Rašelinná glejova půda	Ливадноблатни	Sol gleic Lăcoviste	Gleysols
Солоди (27)			Szolody			Solodiu	Planosols Solodic
Солонцы автоморфные (28)				Solonec		Soloneţ	Solonetz Orthic Mollic
Солонцы полугидроморфные (29)			Sztyeppésedő réti szolonyec	Solonec	Солонци	Soloneţ	Solonetz Orthic Mollic
Солонцы гидроморфные (30)			Szoloncsák-szolonyec Másodlagosan elszikesedett talajok Réti szolonyec talajok	Solonec	Солонци	Soloneţ	Solonetz Gleyic
Солончаки гидроморфные (31)	Sołończaki		Szoloncsák Másodlagosan elszikesedett talajok	Solončak	Солончаци	Solonceac	Solonchaks
Аллювиальные дерновые кислые почвы (32)		Vega		Vega Regosol naplavený	Алувиални (делувиално) почви	Sol aluvial Aluviune	Fluvisols Dystric
Аллювиальные дерновые насыщенные почвы (33)	Gleby inicjalne łuzne (aluvialne) Mady rzeczne	Vega	Humuszos öntéstalaj	Vega Regosol naplavený	Алувиални (делувиално) почвы	Sol aluvial	Fluvisols Eutric
Аллювиальные луговые кислые почвы (34)		Halbamphigley (Typ Amphigley) Vegagley (Typ Grundgley)		Vega	Алувиално (делувиално) ливадни	Sol aluvial	Fluvisols Dystric

СССР	ПНР	ГДР	ВНР	ЧССР	НРБ	СРР	ФАО—ЮНЕСКО
Аллювиальные луговые насыщенные почвы (35)	Mady rzeczne	Vegagley (Typ Grundgley) Halbamphigley (Typ Amphigley)	Réti öntéstalaj	Vega	Алувиално (делувиално) ливадни	Sol aluvial	Fluvisols Eutric
Аллювиальные луговые карбонатные почвы (36)		Kalkvega (Typ Vega) Kalkvegagley (Typ Grundgley)	Öntés réti talaj	Regosol naplavný carbonátný	Алувиално (делувиално) ливадни	Sol aluvial	Fluvisols Calcaric
Аллювиальные лугово-болотные почвы (37)	Gleby mułowe Mady oglejone	Amphigley Grundgley	Mosári erdök talaj	Glej	Алувиално (делувиално) ливадни-заблатени	Sol aluvial	Fluvisols
Аллювиальные болотные иловато-перегнойно-глеевые почвы (38)	Gleby torfowe-mułowe	Humusgley Amphigley Grundgley		Glej		Sol aluvial	Fluvisols
Аллювиально-болотные иловато-торфяные почвы (39)	Gleby torfowe-mułowe	Humusgley Ried Böden mit Müdden		Rašelinná glejová Glej		Sol aluvial	Fluvisols
Горно-луговые почвы (40)		Ranker Rohböden		Ranker	Планинско-ливадни	Sol humicosilicatic Sol litoorganic	Lithosols Rankers
Горно-луговые черноземовидные почвы (41)					Планинско-ливадни	Rendzină	Lithosols Rankers
Неполноразвитые почвы (42)	Gleby inicjalne skaliste Gleby inicjalne luźne Gleby słabo wykształcone ilaste Gleby słabo wykształcone kwarcowokrzemianowe	Ranker Rohböden	Sziklás, köves, kavicsos, területek váztalajai Földes, kopár talaj Homoktalajok Futóhomok Alléri üledekek talajai Öntés talaj Humuszos homok	Surová půda Ranker Regosol	В соответствующих типах на более низких уровнях	Litosol Regosol Psamosol	Lithosols Regosols Arenosols Rankers
Переотложенные и искусственно аккумулированные почвогрунты (43)	Hortisole Rigosole Gleby industroziemne	Kippböden Kolluvialböden		Haldové půdy Koluviální subtypy ar typy půd		Sol antropic desfundat Sol coluvial	

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Key to preceding table:

1. Podzol soils (Podzolitsyye pochvy)
2. Podzols used in farming
3. Cultivated podzols and other intensively-cultivated soils
4. Swamp-podzol soils (Bolotno-podzolitsyye pochvy)
5. Sod-calcareous soils (Dernovo-karbonatnyye pochvy)
6. Sod-gley soils (Dernovo-gleyevyye pochvy)
7. Grey forest soils (Seryye lesnyye pochvy)
8. Grey forest gley soils (Seryye lesnyye gleyevyye pochvy)
9. Brown forest soils (brunizem) (Buryye lesnyye pochvy, burozemy)
10. Brown forest gley soils (Buryye lesnyye gleyevyye pochvy)
11. Podzol-brown forest soils (Podzol-brunizems) (Podzolisto-buryye lesnyye pochvy (podzolisto-burozemnyye)
12. Podzol-brown forest gley soils (podzol-brunizem-gley) (Podzolisto-buryye lesnyye gleyevyye pochvy; podzolisto-burozemnyye gleyevyye)
13. Meadow white (Lugovyye podbely)
14. Chernozems (including compact chernozem) (Chernozemy, chernozemy slityye)
15. Meadow-chernozem soils (including meadow-compact chernozem) (Lugovo-chernozemnyye pochvy, lugovo-chernozemnyye slityye)
16. Chestnust soils (Kashtanovyye pochvy)
17. Meadow-chestnut soils (Lugovo-kashtanovyye pochvy)
18. Meadow soils (Lugovyye pochvy)
19. Cinnamonic soils (Korichnevyye pochvy)
20. Meadow-cinnamonic soils (Lugovo-korichnevyye pochvy)
21. Podzol-yellow soil (Podzolisto-zheltozemnyye pochvy)
22. High moor peat soil (Torfyanyye bolotnyye verkhovyye pochvy)
23. Low moor peat soil (Porfyanyye bolotnyye nizinnyye pochvy)
24. Developed high moor peat soil (Torfyanyye verkhovyye osvoyennyye pochvy)
25. Developed low moor peat soil(Torfyanyye nizinnyye osvoyennyye pochvy)
26. Meadow-bog soils (Lugovo-bolotnyye pochvy)
27. Solod (Solodi)
28. Automorphic solonets (Solontsy avtomorfnyye)
29. Semi-hydromorphic solonets (Solontsy polugidromorfnyye)
30. Hydromorphic solonets (Solontsy gidromorfnyye)
31. Hydromorphic solonchak (Solonchaki gidromorfnyye)
32. Alluvial soddy acidic soils (Allyuvial'nyye dernovye kislyye pochvy)
33. Alluvial soddy base-saturated soils (Allyuvial'nyye dernovye nasyshchennyye pochvy)
34. Alluvial meadow acidic soils (Allyuvial'nyye lugovyye kislyye pochvy)
35. Alluvial meadow base-saturated soils (Allyuvial'nyye lugovyye nasyshchennyye pochvy)
36. Alluvial meadow cälcareous soils (Allyuvial'nyye lugovyye karbonatnyye pochvy)
37. Alluvial meadow-boggy soils (Allyuvial'nyye lugovo-bolotnyye pochvy)
38. Alluvial boggy silty-humus-gley soils (Allyuvial'nyye bolotnyye ilovato-peregnoyno-gleyevyye pochvy)

Continuation of key.

39. Alluvial-boggy silty-peat soils (Allyuviàl'no-bolotnyye ilovato-torfyanyye pochvy)
40. Mountain-meadow soils (Gorno-lugovyye pochvy)
41. Mountain-meadow chernozem-like (Gorno-lugovyye chernozemovidnyye pochvy)
42. Incompletely developed soils (Nepolnorazvityye pochvy)
43. Redeposited and artificially-accumulated soil-ground (Pereotlozhennyye i iskusstvenno-akkumulirovannyye pochvogrunty)

of Bulgaria corresponds to several types of alluvial soils in the USSR soil classification. In Hungary meadow soils are divided into a larger number of types than in any other country, etc. This results in the fact that the types in the soil classifications of some countries correspond to significantly lower taxonomic units in the classifications of others. Further work is required to compare soil classifications at a level lower than the type.

The identification of terms in the classification of soils of European CEMA nations as well as in the FAO-UNESCO classification as presented in this table is of great theoretical and practical significance. The table can be used as reference material for the continued improvement of national soil classifications, for a more precise understanding of their origin and for a thorough knowledge of the laws of soil geography. The mutual exchange of the results and methods of studying soil properties and processes will facilitate the development of practical recommendations on raising soil fertility.

The table is the basis for a uniform consideration of land funds in the CEMA countries. It can be useful for an exchange of experience on the questions of farming and plant growing, particularly when introducing varieties of cultivated crops.

8228
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TILLING AND CROPPING TECHNOLOGY

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WATER REQUIREMENT OF SPRING WHEAT IN DIFFERENT TYPES OF WEATHER

Moscow DOKLADY VASKhNIL in Russian No 12, Dec 79 pp 12-14

[Article by N. I. Kalinin, candidate of agricultural sciences (Presented by VASKhNIL academician K. Z. Budinnyy): "Water Consumption of Spring Wheat in Different Types of Weather"]

[Text] Weather type refers to the complex of meteorological elements characterized by values that are confined within certain, previously prescribed intervals (2).

Because there is no research on the experimental study of water requirements of agricultural crops in different types of weather we decided to study the water requirements of spring wheat of the Leningradka variety in different types of weather. The research was done in the agrometeorological complex of the agrometeorology department of VIR [All-Union Scientific Research Institute of Plant Growing]. The weather types were created in vegetation facilities by regulating the temperature of the air and the moisture of the soil.

The plants were grown in polyethylene vegetation vessels containing 5 kilograms of air-dried soil according to the commonly-used methodology for conducting vegetative experiments. The necessary soil-moisture level was maintained by means of 1-2 daily waterings of the soil in the vessels until the desired weight was reached. The air temperature in the houses was regulated with the aid of AR-4 refrigeration machines and SFOA-40/0.5 calorifers.

The effect on plants of different gradations of air temperature and soil moisture was measured in three periods--the period from shoot-formation until the stooling stage, from the stooling stage until ear formation and from ear-formation until the waxy ripeness stage. In addition there were variants in which plants were subjected to particular air temperatures and soil moisture levels for the entire duration of the vegetative period. Acting as the control were plants that were grown at natural air temperatures and optimal soil moistures (50-60 percent of full moisture capacity). When the plants were not subject to experimental conditions they grew and developed in natural air temperatures and optimal soil moisture levels. Water consumption during the vegetative phase and during separate inter-phase periods of the plant was determined by totaling daily water consumption in grams and then converting it into millimeters.

As we see from Table 1, the level of average daily water consumption by spring wheat is subject to considerable fluctuations depending on the controlling type of weather. With average soil moisture water consumption increases with the rise in the level of the regulated air temperature. Regulating it to a level of 5-15°C during the period from shoot formation to the stooling stage established a water consumption of 2.5 mm per day; on a level of 15-20°C--3.7 mm; 25-35°c--5.0 mm. During the same period the control plants expended 2.2 mm of moisture. The same amount of water was used by the plants of all the other variants which were not subject to the action of regulated elements of weather. In average temperatures the average daily water consumption increases with an increase in soil moisture. The largest amount of water consumption (7.0 mm/day) was noted in the test variant in which during the first period there was a regulation of the air temperature to 25-35°C and of the soil moisture to 80-90 percent PPV [Maximum field moisture capacity of soil].

The regulation of the type of weather during the second period (from stooling stage to ear formation) resulted in the fact that water consumption at a temperature of 5-15°C changed very little depending on the moisture of the soil. In our opinion this is explained by the inertia of the moisture reserves, the small evaporation possibilities of the environment and the short duration of the period. In the variants with the regulation of the air temperature at a level of 15-20 and 25-35°C water consumption increases with the increase in the soil moisture. The smallest consumption (4.8 mm/day) in this series of variants was noted at a temperature of 15-20°C and a soil moisture of 20-30 percent PV [Full moisture capacity of soil]. The largest degree of water consumption (10.4 mm) also took place at a temperature of 15-20°C and an soil moisture of 80-90% PV.

The aforementioned regularity in the change in water consumption depending on the types of weather is maintained in the time that the plant is subjected to experimental conditions from the ear-formation stage to waxy ripeness. For all variants there were consequences to the regulated meteorological conditions when the plant was in a natural setting.

The minimum quantity of average daily water consumption (4-5 mm) was noted during the vegetative period in the variants with a regulated temperature of 5-15, 15-20, 25-35°C during the second and third periods and with a regulation of soil moisture on the level of 20-30% PV and in some variants with a moisture level of 50-60 and 80-90%.

The maximal average daily water consumption during the vegetative period was noted in the variants with a regulated soil moisture of 80-90%PV and air temperature of 25-35°C.

Table 1

Average Daily Water Consumption of Spring Wheat

Test Variant		Time of Effect			
Air Tempera-ture (°C)	Soil Moisture (%PV)	From Shoot Formation Until Stooling Stage			
		Sowing-Stooling Stage	Stooling Stage-Earing	Earing-Waxy Ripeness	Sowing-Waxy Ripeness
5-15	20-30	2.0	7.8	9.6	6.5
	50-60	2.6	8.1	12.1	7.6
	80-90	2.8	7.1	8.7	6.2
15-20	20-30	3.1	6.8	8.9	6.3
	50-60	3.0	8.0	9.3	6.8
	80-90	4.9	7.4	7.9	6.7
25-35	20-30	4.0	5.5	8.0	5.9
	50-60	4.1	6.1	8.6	6.3
	80-90	7.0	6.7	8.8	7.5
Control (natural)	50-60	2.2	6.8	7.8	5.6

Table 2

Total Water Consumption of Spring Wheat (mm)

Test Variant		Time of Effect			
Air Tempera-ture (°C)	Soil Moisture %PV	From Shoot Formation Until Stooling Stage			
		Sowing-Stooling Stage	Stooling Stage-Earing	Earing-Waxy Ripeness	Sowing-Waxy Ripeness
5-15	20-30	88.2	132.4	323.6	544.2
	50-60	113.5	170.1	264.8	548.4
	80-90	121.5	140.8	264.1	526.4
15-20	20-30	83.8	142.5	349.4	575.7
	50-60	76.0	168.0	377.7	621.7
	80-90	210.0	148.0	243.8	601.8
25-35	20-30	111.2	66.0	383.6	560.8
	50-60	113.8	73.2	411.8	598.8
	80-90	182.8	160.8	335.9	679.5
Control (natural)	50-60	76.7	163.2	239.5	479.4

(mm) During Various Types of Weather Conditions

From Stooling to Ear Formation				From Ear Formation to Waxy Ripeness			
Sowing-Stooling Stage	Stooling Stage-Earing	Earing-Waxy Ripeness	Sowing-Waxy Ripeness	Sowing-Stooling Stage	Stooling Stage-Earing	Earing-Waxy Ripeness	Sowing-Waxy Ripeness
2.3	5.6	5.1	4.3	2.2	7.0	5.4	4.9
2.1	6.8	6.8	5.2	2.2	6.8	7.2	5.4
1.8	6.2	7.4	5.1	1.9	6.2	7.7	5.3
2.3	4.8	6.8	4.6	2.1	6.7	6.7	5.2
2.2	8.2	7.7	6.0	2.1	6.2	7.3	5.2
2.2	10.4	6.8	6.5	1.8	6.0	10.6	6.1
2.1	5.4	5.8	4.4	2.0	6.5	4.0	4.2
2.0	7.7	3.8	4.5	2.0	6.6	9.4	6.0
2.0	10.0	3.2	5.1	1.9	6.1	16.3	8.1
2.2	6.8	7.8	5.6	2.2	6.8	7.8	5.6

During Various Types of Weather Conditions

From Stooling to Ear Formation				From Ear Formation to Waxy Ripeness			
Sowing-Stooling Stage	Stooling Stage-Earing	Earing-Waxy Ripeness	Sowing-Waxy Ripeness	Sowing-Stooling Stage	Stooling Stage-Earing	Earing-Waxy Ripeness	Sowing-Waxy Ripeness
87.8	168.0	207.3	463.1	75.6	168.0	209.3	452.9
80.0	210.2	217.6	507.8	76.1	163.2	282.1	521.4
68.6	192.2	236.5	497.3	65.0	148.8	299.0	512.8
86.8	76.6	229.6	393.0	72.7	160.8	181.3	414.8
100.5	138.4	254.3	493.2	71.8	148.8	196.9	417.6
82.5	176.8	223.4	482.7	63.9	144.0	286.3	494.2
73.1	91.8	194.3	359.2	69.1	156.0	83.0	308.1
70.1	130.9	128.6	329.6	70.8	158.4	216.0	445.2
71.2	170.0	107.6	348.8	66.5	146.4	373.5	586.4
76.7	163.2	239.5	479.4	76.7	163.2	239.5	479.4

The data in Table 2 on total water consumption attests to its complex dependency on the biology of the plant and on the levels of air temperature and soil moisture taken separately and together. The greatest water consumption during the vegetation period is secured in cases where there is a regulation of high air temperatures and high soil moisture.

At an average temperature of 20°C and a regulation of soil moisture at 20-30%PV water consumption was 652.2 mm in the period from shoot formation until stooling; from stooling until ear-formation--405.1 mm; from ear-formation until waxy ripeness--391.9 mm. The regulation of moisture at the aforementioned average temperature at a level of 50-60% PV during the first period comprised 589.6 mm during the first period, 443.5 and 461.4 mm during the second and third respectively. The greatest total water consumption was noted with a regulation of soil moisture to 80-90% PV during the period from stooling to ear-formation--602.2 mm. Plants consumed somewhat less water when the said moisture was regulated during the period from ear-formation to waxy ripeness. The convergence of the quantity of water consumption during the regulation of various levels of moisture during the period of stooling to ear formation should be noted. At 20-30%PV plants required 405.1 mm, at 50-60% PV--443.5 mm and at 80-90% PV--442.9 mm.

On the average for all variants with a regulation of soil moisture at 20-30% PV plants required 452.1 mm of water; at 50-60% PV--498.2 and at 80-90% PV--525.5 mm. In the control variant the water consumption of plants comprised 479.4 mm.

With the regulation of weather types in the course of the entire vegetative period of the plant the relationship of consumption to type was somewhat different and clearer. At any level of soil moisture water is utilized most economically at the optimal temperature. For the development of spring wheat the optimal air temperature is 15-20°C.

The regulation of the soil moisture at a level of 20-30% PV at different air temperatures results in the fact that the highest rate of water consumption is noted when the air temperature is 5-15°C. This is explained by the fact that plants vegetate for a relatively long period of time. At a temperature of 25-35° the plant's vegetation is completed too early. Sometimes the plants do not even form ears and they may maintain a vitality on the border of "life and death." For this reason the very minimal water consumption--286.3 mm--was noted in the experiment.

At the optimal soil moisture (50-60% PV) water consumption is higher when the regulated air temperature is 5-15°C (605.9 mm). At 25-35°C water consumption decreases in comparison with the said quantity and comprises 464.1 mm. Water is utilized most economically when the air temperature is maintained at 15-20°C (362.9 mm). The plants that are cultivated during this type of weather are most productive. For this reason, under conditions of greenhouses where it is possible to regulate the basic parameters of the environment it is necessary to strive to maintain the optimal hydrothermal conditions. It is simplest of all to determine the optimal hydrothermal conditions by studying the reaction of the plants to a relatively broad range of conditions (within the limits of experimental values).

With a soil moisture of 80-90% PV at all temperature levels the plant's water consumption is very high. However, even in this case when the air temperature is held at 15-20°C the plant uses moisture most economically.

The total average water consumption for all variants with regulated soil moisture in the course of the entire vegetative period was 375.5 mm at 20-30% PV, 477.6 mm at 50-60% PV and 649.1 mm at 80-90% PV. The average water consumption in the variants where air temperature was regulated in the course of the entire vegetative period was 560.9 mm at 5-15°C, 445.4 at 15-20 and 495.9 mm at 25-35°C.

Thus, water consumption by spring wheat is very complexly related to the type of weather that develops. Plants utilize water most economically under weather conditions that are optimal for the plants' growth, development and productivity. These optimal conditions can be expressed in quantitative indicators which can best and most rapidly be determined by studying the reaction of plants to a broad range of phytoclimactic conditions.

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